PROJECT MANUAL

TENNESSEE STATE UNIVERSITY
FOOTBALL PRACTICE FACILITY

PREPARED FOR:
OWNER

TENNESSEE BOARD of REGENTS
OFFICE of FACILITIES DEVELOPMENT
NASHVILLE, TENNESSEE 37217-2833

SBC Project No. 166/001-03-2007

PREPARED BY:
DESIGNER

MOODY•NOLAN INC.
ARCHITECTS • ENGINEERS • PLANNERS
1625 BROADWAY, 4TH FLOOR

NASHVILLE, TENNESSEE 37203
615-386-9690 FAX 615-386-0528

CONSULTING ENGINEERS:

LITTLEJOHN ENGINEERING ASSOCIATES
CIVIL ENGINEERING

EMC STRUCTURAL ENGINEERS, P.C.
STRUCTURAL ENGINEERING

SMITH SECKMAN REID, INC
MECHANICAL AND ELECTRICAL ENGINEERING

CONSTRUCTION DOCUMENTS
November 19, 2009

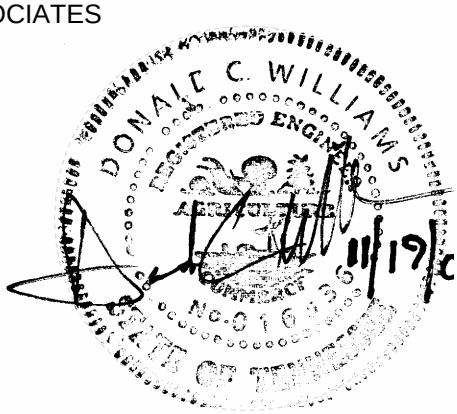
PROJECT DIRECTORY AND DESIGNERS' SEALS

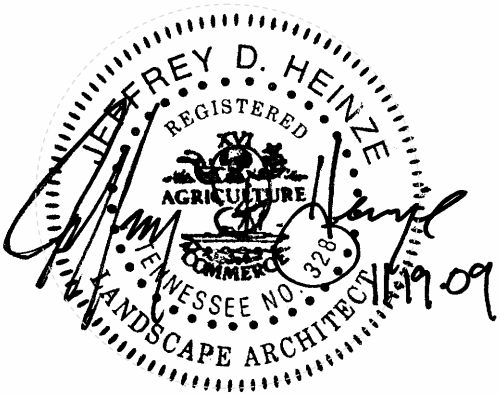
PROJECT:
TENNESSEE STATE UNIVERSITY
Football Practice Facility
3500 John A. Merritt Boulevard
Nashville, Tennessee 37209
SBC Project No. 166/001-03-2007

OWNER
TENNESSEE BOARD of REGENTS
Office of Facilities Development
Suite 664 (6th Floor SW) Genesco Park
1415 Murfreesboro Road
Nashville, Tennessee 37217-2833

ARCHITECT (DESIGNER)
MOODY•NOLAN, Inc
1625 Broadway, 4th Floor
Nashville, Tennessee 37203
Phone: (615) 386-9690
Fax: (615) 386-0528
Contact: Brian Tibbs
Email: btibbs@moodynolan.com

CIVIL ENGINEER / LANDSCAPE ARCHITECT
LITTLEJOHN ENGINEERING ASSOCIATES
1935 Twenty-First Avenue South
Nashville, Tennessee 37212
Phone: (615) 385-4144
Fax: (615) 385-4020
Contact: Travis Todd
Email: ttodd@leainc.com

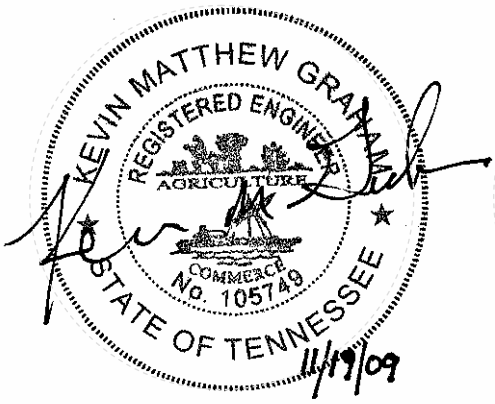


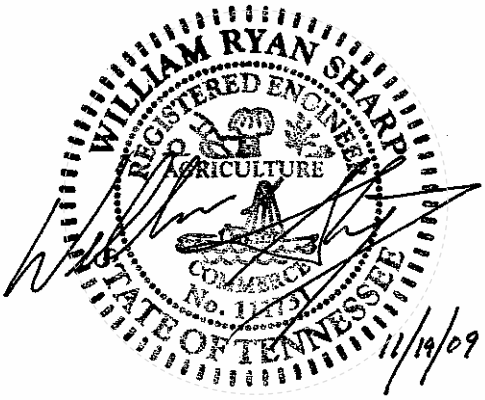


STRUCTURAL ENGINEER
EMC STRUCTURAL ENGINEERS
4525 Trousdale Drive
Nashville, Tennessee 37204
Phone: (615) 781-8199
Fax: (615) 781-4088
Contact: Dan Borsos
Email: danb@emcnashville.com

MECHANICAL / PLUMBING / ELECTRICAL ENGINEERS

SMITH SECKMAN REID, INC.
2995 Sidco Drive
Nashville, Tennessee 37204
Phone: (615) 383-1113
Fax: (615) 386-8469
Contact: Matt R. Clark
Email: mclark@ssr-inc.com





ADDITIONAL CONSULTANTS

SYNTHETIC ATHLETIC FIELD SURFACING

HFR DESIGN, INC.
7101 Executive Center Drive, Suite 300, P.O. Box 1974
Brentwood, Tennessee 37024-1974
Phone: (615) 370-8500
Fax: (615) 370-8530
Contact: Jim Gilliam
Email: JGilliam@hfrdesign.com

END OF SECTION

TABLE OF CONTENTS

			Pages
	Cover Sheet		
00 01 07	Project Directory and Designers' Seals		2
00 01 10	Table of Contents		5
00 01 15	Index of Drawings		2

DIVISION 0 – PROCUREMENT AND CONTRACTING REQUIREMENTS

BIDDING REQUIREMENTS

00 11 16	Invitation to Bid	[TBR]	1
00 21 13	Instructions to Bidders	[TBR]	3
00 22 20	Map to the Bid Opening Location	[TBR]	1
00 31 32	Geotechnical Information Available to Bidders	[TBR]	1
00 38 60	Disqualified Contractors and Subcontractors	[TBR]	1
00 41 13	Bid Form	[TBR]	2

CONTRACTING REQUIREMENTS

00 52 13	Agreement	[TBR]	4
00 54 33	ACH Credits Form	[TBR]	1
00 54 35	Substitute W-9 Form	[TBR]	1
00 61 13	Contract Bond	[TBR]	2
00 61 43	Three Year Roof Bond	[TBR]	2
00 72 13	General Conditions – AIA A201 (*TBR modified version*)	[TBR]	51
00 73 43	Prevailing Wage Rates	[TBR]	2
00 73 46	Wage Determination Form	[TBR]	3

DIVISION 1 - GENERAL REQUIREMENTS

01 11 00	Summary of Work		2
01 23 00	Alternates	[TBR]	1
01 26 00	Contract Modification Procedures	[TBR]	1
01 26 20	Weather Delays	[TBR]	2
01 26 25	Weather Delay Report	[TBR]	1
01 26 40	Forms for Amendment, Change Order or Directive	[TBR]	1
01 26 50	Forms for Itemization	[TBR]	3
01 29 73	Schedule of Values	[TBR]	1
01 29 76	Applications and Certificates for Payment	[TBR]	2
01 31 19	Project Meetings	[TBR]	1
01 31 90	Administrative Logs	[TBR]	1
01 32 15	Progress Schedules and Reports	[TBR]	1
01 33 23	Shop Drawings, Product Data and Samples		4
01 41 15	Basic Regulatory Requirements	[TBR]	1
01 43 25	Testing Laboratory Services	[TBR]	1
01 45 00	Quality Control		1
01 50 00	Temporary Facilities and Controls		8
01 60 00	Product Requirements		5
01 62 25	Product Options and Substitutions	[TBR]	1
01 62 32	Substitution Request Form	[TBR]	2

01 73 00	Execution Requirements		6
01 73 29	Cutting and Patching		3
01 74 00	Cleaning		4
01 77 70	Close-out Procedures	[TBR]	2
01 78 21	Close-out Submittals	[TBR]	1
01 78 25	Data Binder Receipt	[TBR]	1
01 78 36	Roofing System Warranty	[TBR]	3
01 78 88	Report of Subcontractors and Suppliers	[TBR]	1
01 79 21	Demonstration and Training	[TBR]	1
01 79 25	Demonstration and Training Verification	[TBR]	2

DIVISION 2 – EXISTING CONDITIONS

No sections required

DIVISION 3 - CONCRETE

03 30 00	Cast-In-Place Concrete	16

DIVISION 4 - MASONRY

No sections required

DIVISION 5 - METALS

Refer to Section 13 34 19 for Metal Building Systems Structural Framing and Components

05 50 00	Miscellaneous Metals	6

DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

06 10 00	Rough Carpentry	6
06 61 17	Solid Surface Countertops	4

DIVISION 7 - THERMAL & MOISTURE PROTECTION

07 11 13	Bituminous Dampproofing	3
07 21 00	Thermal insulation	4
07 26 00	Below-Grade Vapor Barriers	2
07 62 00	Flashing and Sheet Metal	5
07 84 00	Firestopping	10
07 92 00	Sealants	7

DIVISION 8 - DOORS & WINDOWS

08 11 13	Hollow Metal Doors and Frames	6
08 14 00	Wood Doors	5
08 33 23	Overhead Coiling Doors	5
08 41 13	Aluminum-Framed Entrances and Storefronts	8
08 71 00	Finish Hardware	13
08 81 00	Glass Glazing	6

DIVISION 9 - FINISHES

09 21 16	Gypsum Board Systems		13
09 30 00	Tile		8
09 51 13	Acoustical Panel Ceilings		4
09 65 00	Resilient Flooring		5
09 91 00	Painting		13

DIVISION 10 - SPECIALTIES

10 14 10	Interior Signage		5
10 14 16	Dedication Plaque		2
10 21 14	Plastic (Phenolic) Toilet Compartments		4
10 22 26	Folding Panel Partitions	*[Alternate #1]*	3
10 28 13	Toilet Accessories		4

DIVISION 11 - EQUIPMENT

11 52 13	Projection Screens	*[Alternate #1]*	2
11 66 26	Wall Padding		1

DIVISION 12 - FURNISHINGS

12 33 55	Plastic Laminate Faced Casework	*[Alternate #1]*	8

DIVISION 13 - SPECIAL CONSTRUCTION

13 34 19	Pre-Engineered Metal Building System		8

DIVISION 14 - CONVEYING EQUIPMENT

No Sections Required

DIVISION 21 - FIRE SUPPRESSION

21 05 00	Common Work Results For Fire Suppression		8
21 05 20	Fire Extinguishers, Fire Valves and Cabinets		2
21 05 53	Identification for Fire-Suppression Piping and Equipment		2
21 13 13	Fire Suppression Sprinkler Systems		6
(211313)	Fire Protection Calculations		7

DIVISION 22 - PLUMBING

22 05 00	Common Work Results for Plumbing		10
22 05 23	Valves for Plumbing Piping		2
22 05 29	Hangers for Plumbing Piping		3
22 05 53	Identification of Plumbing Piping and Equipment		2
22 07 00	Plumbing Insulation		3
22 11 16	Domestic Water Piping		5
22 11 19	Domestic Water Piping Specialties		2
22 13 16	Sanitary Waste and Vent Piping		2

22 13 19	Sanitary Waste Piping Specialties	3
22 33 36	Water Heater - Electric	2
22 40 00	Plumbing Fixtures	6

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING

23 05 00	Common Work Results for HVAC	11
23 05 13	Motors for HVAC	4
23 05 14	Variable Frequency Motor Drives	8
23 05 29	Pipe Hangers	3
23 05 48	Vibration Isolation	4
23 05 53	Identification for HVAC Equipment	2
23 05 93	Testing, Adjusting and Balancing for HVAC	8
23 07 00	HVAC Insulation	3
23 09 13	Instrumentation and Control Devices	7
23 09 23	Building Automation and Direct Digital Controls	25
23 11 23	Facility Natural Gas Piping	2
23 20 00	HVAC Piping	4
23 23 00	Refrigeration Piping System	2
23 31 13	Sheetmetal Ductwork	7
23 33 00	Air Duct Accessories	5
23 34 18	In-Line Tubular Centrifugal Fans	2
23 34 36	Propeller Fans	2
23 41 00	Particulate Air Filtration	2
23 73 50	Air Rotation Units	4
23 81 26	Split System A/C Units	2
23 82 39	Unit Heaters	2

DIVISION 26 - ELECTRICAL

26 05 00	Common Work Results for Electrical	8
26 05 19	Low Voltage Electrical Power Conductors	4
26 05 26	Grounding and Bonding for Electrical Systems	2
26 05 29	Hangers and Supports for Electrical Systems	2
26 05 33	Raceways and Conduit Systems	4
26 05 34	Pull and Junction Boxes	2
26 05 35	Outlet Boxes	3
26 05 43	Underground Ducts and Raceways for Electrical Systems	3
26 05 44	Prefabricated Concrete Manhole	6
26 05 53	Identification for Electrical Systems	2
26 05 73	Power System Analysis	7
26 22 13	Low Voltage Distribution Transformers	3
26 24 13	Switchboards	14
26 24 16	Panelboards	4
26 27 26	Wiring Devices	4
26 27 27	Wiring Device Plates	1
26 28 16	Enclosed Switches	2
26 29 13	Motor Starters	2
26 41 13	Lightning Protection Systems	4
26 43 13	Transient Voltage Surge Suppression	4
26 51 13	Interior Lighting Fixtures, Lamps and Ballasts	13
26 56 00	Exterior Lighting	2

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 05 00	Common Work Results for Electronic Safety and Security		5
28 30 00	Fire Detection and Alarm System		13

DIVISION 31 – EARTHWORK

31 11 00	Clearing & Grubbing		3
31 11 10	Demolition		2
31 23 00.13	Foundation Excavation and Backfilling	*[EMC section]*	6
31 23 13	Subgrade Preparation		5
31 23 23	Backfilling & Finish Grading		5
31 23 33	Trenching & Backfilling		5
31 31 16	Termite Control	*[MN section]*	3
31 37 00	Riprap		2
31 71 15	Proof Rolling		2

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 11 23	Base Course for Pavement		3
32 12 16	Asphaltic Concrete Pavement		3
32 13 13	Site Concrete Work		9
32 16 13	Concrete Curbs & Sidewalks		5
32 17 23	Pavement Marking		1
32 18 13	Synthetic Grass Surfacing	*[HFR section]*	10
Drawing	*T 1.0*	*Field Layout Graphics*	
Drawing	*T 1.1*	*Field Dimensions*	
32 92 19	Lawn & Grass Landscaping		4
32 93 00	Trees, Plants & Groundcover		15

DIVISION 33 – UTILITIES

33 11 10	Water Utility Distribution Piping		4
33 13 00	Disinfection of Water Distribution System		3
33 30 00	Sanitary Sewage Systems		5
33 40 00	Storm Drainage Systems		5

END OF TABLE OF CONTENTS

INDEX OF DRAWINGS

SHEET NO.:	DESCRIPTION	
GENERAL		
X 1.0	TITLE SHEET	
X 1.1	INDEX SHEET	
CIVIL & LANDSCAPING		
C 1.0	SITE SURVEY	
C 2.0	EROSION & SEDIMENT CONTROL PLAN	
C 2.1	EROSION & SEDIMENT CONTROL DETAILS	
C 3.0	DEMOLITION PLAN	
C 4.0	SITE LAYOUT PLAN	
C 5.0	GRADING & DRAINAGE PLAN	
C 6.0	SITE UTILITY PLAN	
C 6.1	PUBLIC WATER IMPROVEMENT PLAN	
C 7.0	SITE DETAILS	
C 7.1	SITE DETAILS	
L 1.0	LANDSCAPE PLAN	
SYNTHETIC ATHLETIC FIELD SURFACING		
T 1.0	FIELD LAYOUT GRAPHICS	*[in project manual]*
T 1.1	FIELD DIMENSIONS	*[in project manual]*
T 1.2	FIELD LAYOUT PLAN	
ARCHITECTURAL		
A 0.1	ARCHITECTURAL SITE PLAN	
A 1.0	FLOOR PLAN	
A 1.0A	FLOOR PLAN	***[Alternate No. 1]***
A 1.1	ROOF PLAN	
A 2.0	REFLECTED CEILING PLAN	
A 3.0	EXTERIOR ELEVATIONS	
A 4.0	BUILDING SECTION	
A 5.0	WALL SECTIONS	
A 5.1	WALL SECTIONS	
A 5.2	WALL SECTION DETAILS	
A 6.0	ENLARGED PLANS & INTERIOR ELEVATIONS	
A 7.0	SCHEDULES & DETAILS	
STRUCTURAL		
S 1.1	FOUNDATION PLAN	
S 1.2	ROOF / CEILING FRAMING PLAN	
S 2.1	SECTIONS & DETAILS	
S 2.2	SECTIONS & DETAILS	
S 3.1	GENERAL NOTES	
S 3.2	QUALITY ASSURANCE PLAN	

INDEX OF DRAWINGS

MECHANICAL

M 0.1	HVAC INDEX, LEGEND & SCHEDULES
M 1.0	HVAC PLAN
M 2.0	HVAC ENLARGED PLANS
M 4.1	HVAC DETAILS
M 7.1	HVAC CONTROLS
M 7.2	HVAC CONTROLS
M 7.3	HVAC CONTROLS

PLUMBING & FIRE PROTECTION

P 0.1	PLUMBING LEGENDS, SCHEDULES & NOTES
P 1.0	PLUMBING FLOOR PLAN
P 2.0	PLUMBING ENLARGED FLOOR PLANS
P 3.0	PLUMBING DETAILS
FP 0.1	FIRE PROTECTION LEGENDS, SCHEDULES & NOTES
FP 1.0	FIRE PROTECTION SITE PLAN
FP 2.0	FIRE PROTECTION FLOOR PLAN
FP 3.0	FIRE PROTECTION DETAILS

ELECTRICAL

E 0.1	ELECTRICAL LEGEND, INDEX & SCHEDULES
EL 1.0	LIGHTING FLOOR PLAN
EP 1.0	POWER FLOOR PLAN
ES 1.0	SYSTEMS FLOOR PLAN
E 4.1	ELECTRICAL DETAILS
E 4.2	ELECTRICAL DETAILS
E 5.1	ELECTRICAL DIAGRAMS

END OF INDEX

INVITATION TO BID

PROJECT:

Tennessee State University
Football Practice Facility
SBC Project No. 166/001-03-2007

DESIGNER:

Moody•Nolan, Inc.
1625 Broadway, 4th Floor
Nashville, Tennessee 37203
Tel. 615-386-9690 Fax 615-386-0528 Contact: Brian Tibbs

BRIEF PROJECT DESCRIPTION:

Construction of a wide span pre-engineered metal building practice facility with engineered field turf and an attached lean-to pre-engineered metal building administrative building; with site renovations and new site utilities.

Bids are invited for a General Contract for the Work of the above project.

Bids will be received by the State of Tennessee at

Tennessee Board of Regents (Central Office)
Office of Facilities Development
Suite 664 (6th Floor, southwest) Genesco Office Park
1415 Murfreesboro Road
Nashville, Tennessee 37217-2833

until

2:00 pm local time Wednesday January 13, 2010

at which time and place bids will be publicly opened. Bids sent by mail should be directed to the attention of

Rilla Froggett

Bidding documents may be examined at the Designer's office and at the following Plan Rooms:

F. W. Dodge Plan Room, Nashville, TN
Nashville Contractors' Association, Nashville, TN
Minority Business Development Center, Nashville, TN

Bidding Documents may be obtained from the Designer in accordance with the Instructions to Bidders upon the Designer's receipt of a certified or cashier's check payable to STATE OF TENNESSEE, payable in U.S. Dollars drawn on a U.S. bank, in the amount per set of **$ 150.00**

Bidders submitting bids equal to or greater than $25,000 in value are required to be licensed in accordance with state law. A statement of public contract crime status is required in the Bid form. A five percent (5%) Bid Security is required. Prevailing Wage law applies to any contract equal to or greater than $50,000 in value, or which has been determined to require Highway rates. Non-Discrimination policy applies to this project.

The Owner reserves the right to waive informalities and to reject bids.

INSTRUCTIONS TO BIDDERS

BIDDING DOCUMENTS

1.1 Bonafide prime Bidders and major subcontractors may obtain one Bid Pack, including Bidding Documents, Bid Envelope, and Bid Form, in accordance with provisions of the Invitation to Bid.

1.2 Individuals or firms securing Bid Packs become Bidders of Record, are automatically issued subsequent addenda, and will have deposit refunded upon returning complete Bidding Documents unmarked and in good condition within 15 days after the scheduled opening of bids. Bidders of Record who do not submit a bid are also required to return the unused Bid Envelope. Upon failure to meet these conditions, deposit shall be forfeited.

1.3 Bidders of Record may obtain additional copies of Bidding Documents at cost from Designer, but costs will not be refundable.

EXAMINATION

2.1 Bidders shall carefully examine site and documents to obtain first-hand knowledge of existing conditions and Work proposed. Copies of standards referenced in Project Manual are available for review through Designer's office.

2.2 Contractor will not be given extra payment for conditions which can be determined by examining site and documents.

QUESTIONS

3.1 Bidders shall submit questions about bidding documents to Designer in writing. Replies will be issued to Bidders of Record by addenda and will become part of Contract Documents. Designer and Owner will not make oral clarifications.

3.2 Questions must be received by Designer at least six calendar days before bid opening date.

3.3 No addenda will be issued less than three calendar days before bid opening date.

SUBSTITUTIONS

4.1 Substitutions before receipt of bids shall be as identified in Supplementary Conditions and Division 1 specifications. To request pre-bid approval of substitution, data required by Designer for evaluation must be received 10 calendar days before date set to receive bids. Acceptable substitutions will be identified in addenda.

4.2 Bidders submitting bids in reliance upon a substitution when the substitution has not been approved prior to bidding do so at their own risk.

LIQUIDATED DAMAGES and TIME

5.1 Conditions for liquidated damages are established in Supplementary Conditions. Time for completion and amount of liquidated damages are identified in Bid Form.

QUALIFICATIONS of CONTRACTORS

6.1 Bidders shall be familiar with the Contractors Licensing Act of 1976, as currently amended, codified in Tennessee Code Annotated Sections (TCA §) 62-6-101, et seq. A contract will not be awarded that conflicts with state licensing law.

6.2 In compliance with TCA § 50-9-114(a), potential bidders are advised that the Owner does not operate a certified drug-free workplace program providing for testing.

6.3 Bids submitted for this project shall not include a contractor or subcontractor that has been disqualified from participating in State construction projects under the supervision of the State Building Commission. As a matter of public record, the State Architect maintains a list of those that have been disqualified, and the Owner endeavors to include a current copy of that list in Bidding Requirements for its projects as Information Available to Bidders. Failure to include a current list shall not negate the effect of disqualification.

PRE-BID CONFERENCE

7.1 Pre-Bid Conference may be held approximately 10 days prior to bid opening date at time and place to be announced. Bidders of Record will be notified in writing whether or not a pre-bid conference will be held.

BID FORM

8.1 Make bids on an unaltered bid form furnished by the Designer in Bid Pack and duplicated in Project Manual. Submit one Bid Form. Failure to completely fill out Bid Form may cause bid to be rejected.

8.2 If a Bidder chooses not to bid an Alternate, Unit Price, or Base Bid in a multiple Base Bid project, write "no bid" in the space. To indicate availability of an Add Alternate at no additional charge, write "no charge" in the space. Additional stipulations or qualifications on Bid Form may cause bid to be rejected.

8.3 Bid Form shall be signed by person or persons legally authorized to bind Bidder to contract.

BID SECURITY

9.1 Bid Security is required in the amount of five percent (5%) of total amount bid, including alternates, made payable to State of Tennessee.

9.2 Bid Bonds shall be issued by Surety company licensed to do business in Tennessee by Tennessee Department of Commerce and Insurance, and shall have certified and current Power-of-Attorney for Attorney-in-Fact attached.

9.3 Checks shall be certified or cashier's, payable in U.S. Dollars drawn on a U.S. bank.

9.4 Owner may retain Bid Security of bidders to whom award is being considered until either: 1) Contract has been executed; 2) specified time has elapsed so that bid is not binding; or, 3) bid has been rejected. If Bidder refuses to enter into Contract or fails to furnish all required attachments properly executed, the amount of bid security shall be forfeited to Owner as liquidated damages, not as penalty.

BID SUBMITTAL

10.1 Submit Bid Form, with required attachments, in Owner's Bid Envelope furnished by Designer in Bid Pack. Blank spaces on face of Envelope shall be filled in by Bidder, except blank provided for Designer's approval.

10.2 If work is required for Plumbing, HVAC or Electrical, list subcontractor(s) that will perform that work. If there is no work in a category, write "None Required" in space. If Bidder will perform that work with Bidder's own forces, so indicate. If acceptance of alternate or combination of alternates changes subcontractor, indicate change on bid envelope.

10.3 Provide state contractor license number, expiration date, and applicable classifications for bidder and listed subcontractors.

10.4 Bidders are solely responsible for ensuring that bids are received by the time and at the place identified for receipt of bids. A bid sent by mail shall be enclosed in an envelope clearly marked "Bid Envelope Enclosed". Bids received late will be returned unopened.

WITHDRAWAL and MODIFICATION PRIOR to CLOSE of BIDDING

11.1 Bids, once submitted, may be withdrawn or modified before the scheduled opening time only upon receipt of request signed by a person legally authorized to bind bidder to contract. If bid is withdrawn, it may not be resubmitted. Modifications to bid may be made as "add" or "deduct" only. Oral, telephonic or telegraphic withdrawal or modification will not be considered. After time and date designated for receipt of bids, bid may not be modified during time period stipulated in Bid Form.

RECEIPT and OPENING of BIDS

12.1 Bids will be received and opened at time and place identified in Invitation to Bid.

POST-BID WITHDRAWAL of BID from CONSIDERATION DUE to MISTAKE

13.1 Request to withdraw bid due to mistake must be in writing to the Owner, delivered in person or postmarked certified or registered mail not later than twenty-four hours after the time fixed for receipt and opening of bids. Request shall acknowledge that bidder refuses to enter into contract based on bid and intends to submit original work papers, documents, and materials used in preparation of the bid in like manner within five working days following date of bid opening.

13.2 Bidder making such request will be removed from consideration for award of contract; and, a duly appointed review panel shall consider whether forfeiture of Bid Security should be waived.

CONSIDERATION of BIDS

14.1 To be considered, Bids shall be made in accordance with these Instructions to Bidders. Failure to comply with these bidding requirements may cause bid to be rejected.

14.2 It is Owner's intent to award contract, or multiple contracts in the case of multiple base bids, based upon lowest evaluated responsive bid submitted by responsible bidder for base bid plus alternates (if any) taken in order up to, but not to exceed the Bid Target. When alternates are included in bidding, Bid Target will be announced at bid opening prior to opening bids. Alternates may be accepted or rejected at Owner's discretion, provided that final combination of base bid and accepted alternates does not change low bidder as established by above method.

14.3 In the event of tie bids, preference will be given to in-state bidder over out-of-state bidder; and, if a tie still exists, successful bidder will be determined by chance.

14.4 In the case of a multiple Base Bid, Owner may award a combined contract for the Work of more than one Base Bid if the same bidder is the successful low bidder on each.

14.5 The Owner reserves right to: reject Unit Prices proposed in a bid without invalidating other portions of bid; reject a bid which does not provide all required Unit Prices; waive informalities; and, reject any or all bids.

POST BID INFORMATION

15.1 Each Bidder shall be prepared, if requested by Owner or Designer, to present evidence, within ten days of the request, of experience, qualifications, and financial ability to carry out the terms of the contract.

AGREEMENT FORMS and BONDS

16.1 Agreement form will be the Standard Form of Agreement Between Owner and Contractor included in this Project Manual. The following information and provisions will be filled in prior to the presentation of the Agreement form to Contractor by Owner: 1) Contracting Agency, Contractor, Project, and Designer will be identified on page one; 2) A full enumeration of the Contract Documents which make up the Agreement will be provided in Article 1; 3) Provisions for Contract Time and Liquidated Damages will be incorporated in Article 2; 4) The Contract Sum and the basis upon which it is determined, and Unit Prices proposed as a part of the successful bid which are accepted by the Owner, will be stated in Article 3; and, 5) The signature page will provide for a single signature by the Contractor, and will provide for the several signatures on behalf of the Owner as required by law and policy.

16.2 Successful Bidder shall complete and provide an Authorization Agreement for Automatic Deposits on the ACH Credits Form included in this Project Manual.

16.3 If the Contract Sum exceeds $100,000, the successful Bidder shall provide Contract Bond in the amount of one-hundred percent (100%) of the Contract Sum, and a Three Year Roof Bond, if and as stipulated in the Bid Form. Bonds shall be provided in accordance with paragraph 11.5 of the Conditions of the Contract and paragraph 17.2 below on the Owner's standard bond forms included in this Project Manual.

EXECUTION and AWARD of CONTRACT

17.1 Presentation of Agreement form by Owner to Successful Bidder for signature does not constitute award of Contract. Contract shall not be considered awarded until Bidder has received a fully executed Agreement.

17.2 If a Bidder is presented the written Agreement form for signing, then that Bidder shall deliver to the identified Owner's representative, within five calendar days after presentation, the required number of counterparts of the signed Agreement Form, Contract Bond, Roof Bond (if required), certificates of insurance, ACH Credits Form, and substitute W-9 federal tax form.

17.3 For the purpose of computing time, the five days referred to in paragraph 17.2 commence the day after receipt of the agreement form by Bidder. Should the fifth day fall on an State holiday, weekend, or other day of Owner's closing, Bidder shall provide required documents as directed no later than the next working day; however, regardless of circumstances or causes for Bidder exceeding delivery time, Owner shall be entitled to either require forfeiture of bid security or to add for each day the Bidder exceeds the five day period a corresponding extra day in which to return a fully executed contract, which return will be considered effectuated by mailing Agreement to the Contractor within the required time plus any extensions provided herein.

17.4 Owner will fill in date of Agreement on all forms when last signature is affixed. Last signature will be by Owner.

MINORITY PARTICIPATION

18.1 It is the express desire of the State Building Commission to include an emphasis on diversity in its contractual relationships with contractors for the construction, demolition, or renovation of State projects under jurisdiction of the Commission. The Commission acknowledges that firms who demonstrate and embrace diversity within their programs and policies are assisting the State in achieving its goals in building a more reflective marketplace of the community within this state. The State will require the successful bidder to report to the State the names and amounts of contracts entered into with minority-owned businesses on State projects in order for the State to collect data on such participation, as set forth in the Conditions of the Contract.

END of INSTRUCTIONS to BIDDERS

BID FORM

TO: **STATE OF TENNESSEE**
for the **PROJECT:** Tennessee State University
Football Practice Facility
SBC Project No. 166/001-03-2007

A. The Bidder hereby acknowledges, attests, certifies, warrants, and assures that:

1. Bidder has received, read, and understands the Bidding Documents, has visited the site and become familiar with local conditions under which work is to be performed, has correlated observations with requirements of Bidding Documents, and makes this bid in accordance therewith. Procurement Requirements documents numbered 00 30 00 through 00 39 99 provide Available Information that was prepared solely for Designer's use in design of this Work and have not been relied upon in the preparation of this bid. The use and interpretation of such information for any purposes is entirely the responsibility of the using party.

2. Contractors and subcontractors that have been disqualified from participating in State Building Commission projects have not been included in this bid, and will not be allowed to perform work under the contract that may result; and, Bidder shall not knowingly utilize the services of an illegal immigrant in the performance of this Contract and shall not knowingly utilize the services of any subcontractor or consultant who will utilize the services of an illegal immigrant in the performance of this Contract.

3. Failure to complete Bid Form, provide required attachments, or comply otherwise with the Instructions to Bidders, may be cause for rejection of bid; the person who signs this bid on behalf of the Bidder is required to be legally empowered to bind the Bidder to a Contract; and, the required Bid Security, in the amount of five percent (5%) of the total amount bid, is attached hereto.

4. The following statement is (check the one that is applicable)

☐ True
☐ False

The Bidder and/or any of the Bidder's employees, agents, independent contractors and/or proposed subcontractors have been convicted of, pled guilty to, or pled nolo contendere to any contract crime involving a public contract.

5. This Bidder has received the following addenda:

Addendum No _____ dated _____
Addendum No _____ dated _____
Addendum No _____ dated _____

B. This Bidder agrees to:

1. Honor this bid for a period of forty five (45) days following the date of the scheduled opening of bids.

2. Enter into and execute a contract, if presented on the basis of this bid, and furnish certificate(s) of insurance and other documents related to the contract as required, including, if the Contract Sum exceeds one-hundred-thousand dollars ($100,000), the Contract Bond and the Three Year Roof Bond, the latter in the amount of **$290,000.00**

3. Accomplish the Work in accordance with the Contract Documents.

4. Achieve Substantial Completion of the Work **180** calendar days from and including the date stipulated in the Notice to Proceed.

5. Accept the conditions for Liquidated Damages in the amount of **250** per calendar day.

BASE BID:

This Bidder agrees to complete the Work of the Base Bid for this project for the lump sum of (show amount in both words and figures):

_____and_____/100ths Dollars

$_____

ALTERNATES:

No. 1	Administration Offices Interior Finish-out	ADD	$_____
No. 2	Landscaping (non-essential as indicated)	ADD	$_____
No. 3	EMC hook up to campus system	ADD	$_____

Submitted by:

Authorized signature: _____ Date: _____

Name and title:
(Type or print) _____

On behalf of:
(Name of Bidder) _____

Bidder's address:
(Please give Street and Mailing address if different) _____

Bidder's Telephone Number: _____ Bidder's Fax Number: _____

Bidder's contact's email address: _____

Agreement

Between Owner and Contractor

where the Basis of Payment is a
STIPULATED SUM

Use only with the coordinated documents identified in the current
Designers' Manual
for projects of the State Building Commission of Tennessee and the Tennessee Board of Regents

AGREEMENT

made as of the day of in the year of

BETWEEN the Owner: **STATE OF TENNESSEE**
via the Contracting Agency: **Tennessee Board of Regents**

and the Contractor:

the Project:

the Designer:

The Owner and the Contractor agree as set forth below.

ARTICLE 1
THE WORK AND THE CONTRACT DOCUMENTS

1.1 The Contractor shall perform all the Work required by the Contract Documents for the Project identified on page one.

1.2 The Contract Documents are identified in the Conditions of the Contract (General, Supplementary, and other Conditions). These form the Contract and constitute the entire agreement between the Owner and the Contractor, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. An enumeration of the Contract Documents appears in paragraph 1.4.

1.3 Terms used in this Agreement which are defined in the Conditions of the Contract shall have the meanings designated in those Conditions.

1.4 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated as follows:

ARTICLE 2
TIME OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

2.1 The Work to be performed under this Contract shall be commenced on the date stipulated in the Notice to Proceed;
and, subject to authorized adjustments, Substantial Completion shall be achieved

2.2 Liquidated Damages, as set forth in paragraph 9.12 of the Supplementary Conditions, are

ARTICLE 3
CONTRACT SUM

3.1 The Owner shall pay the Contractor in current funds for the performance of the Work, subject to additions and deductions by Change Order as provided in the Contract Documents, the Contract Sum of

3.2 The Contract Sum is determined as follows:

3.3 The following Unit Prices will be used as specified:

This Agreement entered into as of the day and year first written above as witnessed:

BY CONTRACTOR:

Signature: _____

Name: _____

Title: _____

AND BY OWNER: STATE OF TENNESSEE
Tennessee Board of Regents

APPROVED: _____

APPROVED: _____

APPROVED: _____

BY: _____

END of AGREEMENT FORM for the Project titled:

ACH CREDITS FORM

Automated Clearing House Credits (not wire transfers)

Authorization Agreement for Automatic Deposits

Name: _____

Federal Identification Number or Social Security Number under which you are doing business with the State: _____

I/we hereby authorize the State of Tennessee, hereinafter called the STATE, to initiate credit entries to my/our

select type of account ☐ Checking or ☐ Savings

account indicated below and the depository named below, hereinafter called DEPOSITORY, to credit the same to such account. This authority to remain in full force and effect until the STATE has received notification from me (or either of us) of its termination in such time and in such manner as to afford the STATE and DEPOSITORY a reasonable opportunity to act on it.

Do you currently receive payments from the State through ACH? ☐ Yes ☐ No

If yes, do you intend for this account information to replace other existing account information currently used by the State? ☐ Yes ☐ No

If yes, please specify the account that should be changed:

ABA Number: _____ *Account Number:* _____

Is this authorization only for certain types of payments? ☐ Yes ☐ No

If yes, please indicate types:

_____

_____

Many banking institutions use different numbers for ACH.
Please call your bank for verification of ACH transit and account number.

Bank official contacted: _____ Phone number: _____

Depository / Bank:

Name: _____ Branch: _____

City: _____ State: _____

Transit/ABA No. _____ Account No.: _____

please print name(s) of authorized account signatory

Name(s) _____

Date _____ Signed: _____ Signed: _____

Please attach a deposit slip (or for checking accounts, a voided check).

Please indicate address to which you would like your remittance advisories routed when payments are processed:

For State use only: Contact Agency: _____

Contact Person: _____

Telephone No.: _____

SUBSTITUTE W-9 FORM

Request for Taxpayer identification number and certification

1. Please complete general information:

Name: _____ Phone Number: _____

Business Name *(if applicable)*: _____

Address: _____

City: _____ State: _____ Zip Code: _____

2. Circle the most appropriate category below: *(Please circle only one)*

1) Individual (not an actual business)

2) Joint account (two or more individuals)

3) Custodian account of a minor

4) **a)** Revocable savings trust (grantor is also trustee)

b) So-called trust account that is not a legal or valid trust under state law

5) Sole proprietorship (using a social security number for the taxpayer ID)

6) Sole proprietorship (using a federal employer identification number for taxpayer ID)

7) A valid trust, estate, or pension trust

8) Corporation

9) Association, club, religious, charitable, educational, or other non-profit organization (for entities that are exempt from federal tax, use category 13 below)

10) Partnership

11) A broker or registered nominee

12) Account with the Department of Agriculture in the name of a public entity that receives agricultural program payments

13) Government agencies and organizations that are tax-exempt under Internal revenue Service guidelines (i.e., IRC 501(c)3 entities)

3. Fill in your taxpayer identification number below: *(Please complete only one)*

1) If you circled number 1 - 5 above, fill in your Social Security Number.

____ ____ ____ - ____ ____ - ____ ____ ____ ____

2) If you circled number 6 - 13 above, fill in your Federal Employee Identification Number (EIN).

____ ____ - ____ ____ ____ ____ ____ ____ ____

4) Sign and date the form:

Certification - Under penalties of perjury, I certify that the number shown on this form is my correct taxpayer identification number. If I circled category 13 above, I also certify that my agency or organization is tax-exempt per Internal revenue Service guidelines and not subject to backup withholding.

Signature: _____ Date: _____

Title *(if applicable)*: _____

CONTRACT BOND

standard form for construction contracts under the State Building Commission of Tennessee

BOND NO. _____

Know all men by these presents: that we

(hereinafter called the "Principal") and

hereinafter called the "Surety") do hereby acknowledge ourselves indebted and securely bound and held unto

(hereinafter called the "Owner"), and in the penal sum of

good and lawful money of the United States of America, for the use and benefit of those entitled thereto, for the payment of which, well and truly to be made, we bind ourselves, our heirs, our administrators, executors, successors, and assigns, jointly and severally, firmly by these presents.

But the condition of the foregoing obligation or bond is this:

Whereas, the Owner has engaged the principal for the sum of

to complete the Work of the project titled:

as more fully appears in a written agreement or contract bearing the date of

a copy of which said agreement or contract is by reference hereby made a part hereof, as fully and to the same extent as if copied at length herein, and it is the desire of the Owner that the Principal shall assure all undertakings under said agreement or contract and shall assure and protect all laborers and furnishers of material on said Work both as provided by Tennessee Code Annotated Sections 4-15-102(f)(2) and 12-4-201 through 12-4-206, and any and all amendments thereto, and shall assure the prompt payment of claims as provided by Tennessee Code Annotated Sections 12-4-207 through 12-4-208, and any and all amendments thereto. The Principal shall also comply with provisions of Tennessee Code Annotated Sections 12-4-401 through 12-4-415, and any and all amendments thereto, pertaining to the payment of the prevailing wage rate.

Now, therefore, if the Principal shall fully and faithfully perform all undertakings and obligations under the contract hereinbefore referred to and shall fully indemnify and hold harmless the Owner from all costs and damage whatsoever which it may suffer by reason of any failure on the part of the Principal to do so, and shall fully reimburse and repay the Owner any and all outlay and expense which it may incur in making good any such default, and shall fully pay for all of the labor, material and work used by the Principal and any immediate or remote sub-contractor or furnisher of material under him in the performance of said contract, in lawful money of the United States, as the same shall become due, then this obligation or bond shall be null and void, otherwise to remain in full force and effect.

And for value received, it is hereby stipulated and agreed that no change, extension of time, alteration or addition to the terms of the contract or to the Work to be performed thereunder or to the specifications accompanying the same shall in any wise affect the obligation under this bond, and notice is hereby waived of any such change, extension of time, alteration or addition to the terms of the contract or to the Work or to the specifications.

In witness whereof the Principal has hereunto affixed its signature and Surety has hereunto caused to be affixed its corporate signature and seal, by its duly authorized officers, on this _____ day of _____, 20___.

Executed in _____ counterparts.

Witness:

_____	_____
(name of Principal)	*(name of Surety)*
_____	_____
(authorized signature)	*(signature of Attorney-in-fact)*
_____	_____
(name of signatory)	*(name of Attorney-in-fact)*
_____	_____
(title of signatory)	*(Tennessee license number of Agent or Attorney-in-fact)*
	_____
	(countersignature of resident Agent if not same as Attorney-in-fact)

Surety Company issuing bond shall be licensed to transact business in State of Tennessee by Tennessee Department of Commerce and Insurance. Bonds shall have certified and current Power-of-Attorney for the Surety's Attorney-in-Fact attached. Attorney-in-fact who executes bond on behalf of Surety shall be licensed by and a resident of State of Tennessee, and shall affix license number to bond; or, countersignature by a licensed agent who is a resident of State of Tennessee, and the agent's license number, shall be affixed to the bond in addition to the signature of the Attorney-in-Fact.

Compliance with State of Tennessee Laws Requiring Payment of

Prevailing Wage Rates

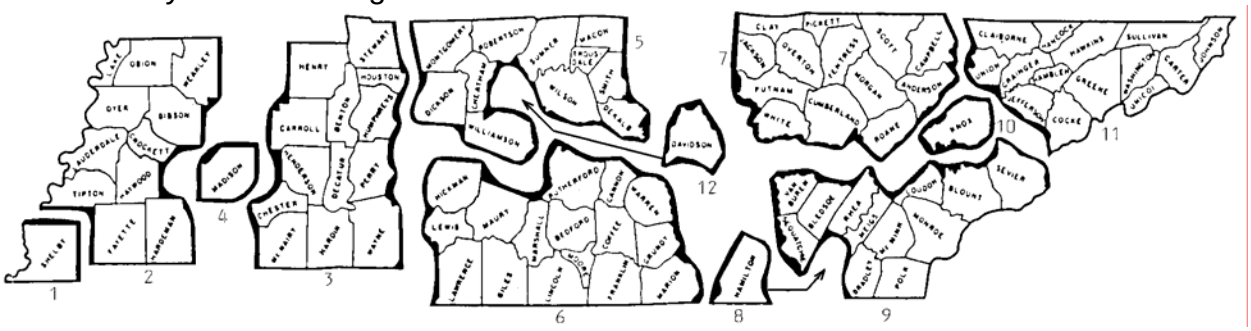
A. Refer also to the other Conditions of the Contract, particularly:

1. For projects using OFD General Conditions for General Work, which is a modified version of AIA document A201, subparagraph 3.4.6.

2. For projects using OFD General Conditions for Minor Work, subparagraph 3.4.4.

B. Establishment of Rates:

1. TCA § 12-4-401, et seq, mandates minimum rates to be paid to the workers on State construction projects. Pursuant to that law, a Wage Rate Determination is included in the bidding and contract documents, following this document, and includes a form identifying a Decision Number followed by a list or lists of rates for building construction and/or highway construction, as determined applicable by the Department of Labor and Workforce Development (DoL&WD) and indicated in the Determination. Highway rates are state-wide, but Building Rates are issued for 12 regions. The map below is believed to accurately reflect the regions.



2. Depending on the Work, multiple rates may apply, and multiple lists may be required. Anyone using a rate list should beware of the remote possibility of a clerical error in the issuance.

C. To determine the rates required to be paid laborers and mechanics on the project:

1. Refer to the Wage Rate Determination(s) to see whether Building Rates, Highway Rates, or both apply.

2. For Work that requires Building Rates in more than one county, if the counties are in more than one of the 12 Building Rate Regions, there is normally a separate Determination for each Region, and a separate list of rates for each region. Each regional list of building rates normally has the Region identified at the bottom of the page, and applies to Work performed in that Region. Occasionally, a table of rates for all 12 regions is included.

3. Highway Wage Rates, when applicable, apply state-wide in all locations.

4. Further details about Prevailing Wage regions, regulations, and descriptions of the craft classifications can be obtained from the DoL&WD Division of Labor Standards, including but not limited to their website: http://www.state.tn.us/labor-wfd/prevail.html

5. If federal wage rates are also required, the required documents pertaining thereto are to be included here following the list(s) of State rates. In such cases, and when workers are employed for work listed in both rate schedules, the workers are to be paid the higher of the scheduled rates.

D. To report the rates paid laborers and mechanics on the project:

1. Refer to the Wage Rate Determination(s) for identification and address of Inspector.
2. If there is more than one Determination, prepare a separate report for the portion of Work each covers.
3. Include Decision Number on report.
4. Send report to the Inspector listed in the box headed “Report to”.

E. Claims by the State for non-compliance.

1. If the DoL&WD suspects that a worker is not being paid in accordance with the Prevailing Wage Rates, the DoL&WD may make an estimate of the possible wage liability and bring that to the attention of the Owner.

2. The Owner may treat the DoL&WD estimate of wage liability as a claim.

END of document.

Combined Request and Decision form for

Wage Determination

Request made by	
Name of person	Trish Whitlock
Title	Project Manager
Department, Agency, or Bureau	Tennessee Board of Regents Office of Facilities Development
Address and phone	Suite 664 1415 Murfreesboro Road Nashville, Tennessee 37217-2833 Fax: (615) 366-3992

Date of request	Date of Advertisement	Supercedes Decision
11/12/2009	12/02/2009	

If Work is in multiple building rate regions, a separate request is required for each region; and, if in multiple counties within a region, all counties must be listed.

The Project		
City	**State**	**County**
Nashville	TN	Davidson

Project Identification

SBC Project No. 166/001-03-2007
Football Practice Facility
Tennessee State University
Nashville, TN

Brief Project Description

Construct a 225' x 270' pre-engineered building for indoor practice and football meeting/operations facilities with a 225' x 30' build out.

Decision rendered by
State of Tennessee Dept. of Labor and Workforce Development Labor Standards Division 220 French Landing Drive Nashville, Tennessee 37243-1002

Wage Determination

Decision Number **T-32901**

Building Rates	[X]	Apply
	[ ]	Do not apply
Highway Rates	[ ]	Apply
	[X]	Do not apply

Report to

INSPECTOR THOMAS HAMLETT
DEPT. OF LABOR & WORKFORCE DEV.
DIVISION OF LABOR STANDARDS
220 FRENCH LANDING DRIVE
NASHVILLE, TN. 37243-1002

Date assigned	Assigned by
11/12/2009	Michael Dattilo

The project identification and brief project description given herein shall not act to define, expand, or limit the Work required by the Contract Documents. Such information provided herein is intended only as information to the Department of Labor and Workforce Development. No other use or interpretation is intended.

CLASSIFICATION	CLASSIFICATION	REGIONS	1	2	3	4	5	6	7	8	9	10	11	12
Boilermaker	Constructor de Calderas	01	21.22	16.82	18.13	15.53	16.27	15.15	20.23	20.86	18.98	19.25	13.57	16.05
Bricklayer	Ladrillero	02	18.78	23.16	18.57	15.44	25.03	24.85	18.49	23.69	20.27	17.39	11.97	20.00
Carpenter	Carpintero	03	20.31	15.76	19.51	18.86	16.65	18.29	21.95	20.52	18.12	17.80	14.14	17.21
Cement Finisher, Plaster	Terminador de Cemento	04	17.25	13.99	15.15	14.17	13.32	14.81	21.68	18.09	16.36	17.58	14.04	16.45
Class "A" Operator	Operador Clase "A"	05	20.42	17.87	19.99	16.39	16.45	18.65	22.64	17.24	14.35	18.78	14.18	16.60
Class "B" Operator	Operador Clase "B"	06	13.50	12.53	14.55	12.62	10.87	11.84	13.99	14.43	11.60	11.23	8.52	11.73
Class "C" Operator	Operador Clase "C"	07	15.88	18.50	13.30	12.82	12.52	12.44	15.06	17.08	10.30	15.77	10.97	12.26
Electrician	Electricista	08	22.06	22.03	18.20	18.83	21.01	22.45	23.24	25.93	20.35	21.56	17.56	21.81
Low Voltage Electrician <70 Volts	Electricista De Bajo Voltaje <70 Volts	09	20.30	16.64	16.64	16.64	15.50	17.28	16.64	16.64	16.64	16.31	16.64	17.23
Elevator Constructor	Constructor de Elevadores	10	20.32	15.96	17.71	14.72	24.81	24.65	18.36	20.39	18.52	19.14	19.04	25.18
Glazier	Vidriero/Rebanadador	11	20.12	18.17	14.65	12.19	18.22	17.45	16.90	16.23	15.89	16.07	16.09	17.39
Insulation Worker for Mechanical Trades / Asbestos Worker	Trabajador de Insulacion para Entramador de Mecanico/ Trabajadora De Asbesto	12	21.87	22.99	23.01	19.31	17.49	18.44	20.25	20.99	19.92	14.02	13.40	18.01
Iron Worker: Structural, Reinforcing, Ornamental	Herrero	13	21.03	17.09	14.14	19.30	16.26	21.13	21.42	21.20	16.93	15.24	13.80	19.46
Laborer Class A	Obrero Clase A	14	13.12	12.29	11.97	11.91	16.83	12.27	13.38	12.46	11.67	13.94	10.28	12.41
Laborer Class B	Obrero Clase B	15	12.90	9.79	15.80	11.24	11.76	11.78	14.49	10.86	11.15	11.43	9.22	12.50
Millwright	Tornero	16	18.14	14.05	16.71	14.28	15.62	20.76	18.94	19.16	15.89	15.19	23.60	19.80
Painter/Plasterer	Pintor/Yesero	17	17.53	17.85	20.22	12.32	14.15	12.87	19.53	17.07	12.86	15.32	14.26	15.09
Pipefitter/Plumber	Instalador de Tuberia/Plomero	18	25.22	22.55	22.47	21.58	20.25	26.52	24.48	20.99	15.06	17.50	15.70	25.97
Roofer	Tejero/Instalador de Techos	19	19.59	13.37	15.45	11.54	13.54	13.13	17.26	20.60	14.57	16.83	14.02	20.43
Sheet-Metal Worker	Hojalatero	20	26.50	22.29	23.81	15.57	19.98	22.68	23.80	19.61	15.76	19.03	17.86	21.97
Truck Driver (3 or more axles)	Camionero (3 o más ejes)	21	15.13	10.62	11.96	10.26	12.85	12.44	17.48	17.71	9.70	10.83	11.15	16.21
Truck Driver (2 axles, over 1 ton)	Camionero (2 ejes,más de 1 tonelada)	22	16.00	8.48	9.41	10.80	13.55	9.40	11.01	14.19	10.01	12.05	11.42	17.93
Truck Driver (2 axles, 1 ton & less)	Camionero (2 ejes,menos de 1 tonelada)	23	15.37	9.26	10.27	10.93	10.60	8.33	17.41	13.91	9.41	10.61	13.73	10.63

APPRENTICESHIP REGULATIONS

Under T.C.A., §12-4-415, the Prevailing Wage Commission has promulgated Rule 0800-3-2-.01(1) which provides that: "Apprentices shall mean those persons registered individually under a bona fide apprenticeship program registered with the Bureau of Apprenticeship and Training in the United States Department of Labor. The state agency contracting officer shall require the contractor or sub-contractor using the apprentice to submit evidence of his indenture and/or apprenticeship registration when the apprentice's name first appears on a submitting payroll."

AUTHORITY: T.C.A. §12-4-415. **Administrative History:** Original Rule filed June 4, 1976. Effective: July 14, 1976.

The Tennessee Department of Labor and Workforce Development is an equal opportunity employer. Auxiliary aids and services are available upon request to individuals with disabilities.
TTY: 615-532-2870; 1-800-848-0299; TTY/TDD 711.

Tennessee Department of Labor and Workforce Development, Authorization No. 337462. 600 copies. 02/07 This document has been promulgated at a cost of $.02 per copy.

REGION 1
Shelby

REGION 2
Crockett
Dyer
Fayette
Gibson
Hardeman
Haywood
Lake
Lauderdale
Obion
Tipton
Weakley

REGION 3
Benton
Carroll
Chester
Decatur
Hardin
Henderson
Henry
Houston
Humphreys
McNairy
Perry
Stewart
Wayne

REGION 4
Madison

REGION 5
Cheatham
Dekalb
Dickson
Macon
Montgomery
Robertson
Smith
Sumner
Trousdale
Williamson
Wilson

REGION 6
Bedford
Cannon
Coffee
Franklin
Giles
Grundy
Hickman
Lawrence
Lewis
Lincoln
Marion
Marshall
Maury
Moore
Rutherford
Warren

REGION 7
Anderson
Campbell
Clay
Cumberland
Fentress
Jackson
Morgan
Overton
Pickett
Putnam
Roane
Scott
White

REGION 8
Hamilton

REGION 9
Bledsoe
Blount
Bradley
Loudon
McMinn
Meigs
Monroe
Polk
Rhea
Sequatchie
Sevier
Van Buren

REGION 10
Knox

REGION 11
Carter
Claiborne
Cocke
Grainger
Greene
Hamblen
Hancock
Hawkins
Jefferson
Johnson
Sullivan
Unicoi
Union
Washington

REGION 12
Davidson

SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.01 GENERAL PROJECT DESCRIPTION

A. Project Description: This project consists of the construction of a wide span pre-engineered metal building (indoor practice facility) with engineered field turf and an attached lean-to pre-engineered metal building (administrative wing), totaling 63,260 GSF; with site renovations and new site utilities, for Tennessee State University. The project is located at 3500 John Merritt Boulevard, Nashville, TN 37209, as indicated on Project Documents prepared by Moody Nolan, Inc. 1625 Broadway, Suite 400, Nashville, TN 37203.

B. Project is to be constructed under a single prime contract.

C. A subsurface geotechnical investigation has been performed per Section 00 31 32. All other testing and inspections shall be performed by testing firms hired by and paid for by the Contractor, as approved by the Architect. See the various specification sections for testing requirements.

1.02 DESCRIPTION OF WORK

A. The following is a brief description of work under Contract for this project. Refer to the drawing package and project manual for total scope of work:

1. Selected site demolition and removal / disposal of all materials including excavated materials determined to be unsuitable for backfill, fill or grading by the Geotechnical Engineer.
2. Site clearing, grading, landscaping and paving; and erosion control.
3. Subsurface utility installations and utility services along with complete storm drainage and sanitary sewer systems.
4. Complete metal building system for combined long-span and lean-to engineered structure along with all related structural components.
5. Complete finish out of long span practice facility (55,320 GSF) including field turf, MPE systems, all service utilities and related site work.
6. Complete the building shell portion of the attached lean-to metal building system (7,940 GSF), with related structural components and site work. The interior finish-out portion of this wing (2,725 GSF) will only occur in the lobby, toilet, training and service rooms. The finish out of the remaining areas will be the scope of work in alternate #1 (see Section 01 23 00).
7. Coordination of new work with existing campus systems.

1.03 PROJECT SCHEDULE

A. Prepare a detailed construction procedure and schedule and submit it to the Architect for approval. Such procedure and schedule must be approved in writing by the Architect prior to the start of construction work. See General Conditions,

Article 14 and Section 01 32 15.

B. Completion of the work within the time frame allotted is critical to the project and the schedule will be strictly adhered to. Contractor shall be responsible for the expediting of the fabrication and delivery of materials and equipment and shall coordinate delivery of same with the approved construction schedule to allow for completion within the time period specified in the Form of Proposal.

1. It is recognized that the work can be unavoidably affected or influenced by governing regulations, natural phenomena including weather conditions and other forces outside the Contract Documents. However, every effort must be made to keep the project on schedule due to the firm deadline established by the Owner for this particular phase of the work.

1.04 MISCELLANEOUS PROVISIONS

A. Performance Requirements for Completed Work: Provide the final and completed project complete and ready for use in every respect by the completion date specified herein.

1. Contract Documents indicate the intended occupancy and utilization of the building and its individual systems and facilities. Compliance with all applicable governing regulations, codes and standards is intended and required for the work and for the Owner's occupancy and utilization.

2. In addition to the requirement that every element of the work comply with applicable requirements of the Contract Documents, it is also required that the work as a whole comply with all applicable industry standards and governing codes and regulations.

3. All Work, including means and methods, shall comply with the regulations and procedures established by the Tennessee Board of Regents (Owner).

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 - GENERAL

1.01 SECTION INCLUDES identification of each Alternate by number, and describes the basic changes to be incorporated into the Work if a particular alternate is made a part of the work by specific provisions in the Agreement between the Owner and the Contractor.

1.02 RELATED SECTIONS are referenced in the definition of each Alternate.

1.03 COORDINATION of related work and modifications to surrounding work as required to properly integrate each Alternate, and to provide the complete construction required by the Contract Documents, is the responsibility of the Contractor.

1.04 DESCRIPTION OF ALTERNATES:

Alternate No. 1 [Administration Offices]

Base Bid	Provide scope of work as indicated on Sheet A 1.0, including unfinished shell for the administration building.
Alternate	Provide complete interior finish-out of administration building, including MPE, as indicated on Sheet A 1.0 A.

Alternate No. 2 [Landscaping]

Base Bid	Provide landscaping as indicated on Sheet L.1.0.
Alternate	Provide non-essential trees and shrubbery as highlighted on landscape plan.

Alternate No. 3 [Emergency Management Control (EMC) Hook-up]

Base Bid	No connection to existing system.
Alternate	Provide connection to campus-wide system.

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SUPPORTING DOCUMENTATION for PROPOSALS or CLAIMS

A. Propose related changes to Work, Contract Sum, and Contract Time, in writing together. Propose unrelated changes separately. Attach and reference pertinent documents related to the change.

B. For a change in the Work, specifically describe proposed change, or briefly describe the proposed change with specific reference to a completely descriptive attachment, such as a Request for Proposal from the Designer.

C. For a change in Contract Sum, state briefly the reason for change, state the amount, and provide itemization of values on forms shown in Section 01 26 50, or similar forms providing the same information:

1. **Itemization Summary:** listing the itemizations of work by subcontractors and the Contractor that together apply to an entire related change in work.
2. **Itemization of Class 1 Time-Related Expenses:** if applicable, deriving an average cost per day.
3. **Itemization of Work:** detailing the quantities, units, costs, and extensions for materials, equipment, and labor, subtotaled, plus overhead, and profit related to a specific proposed change in the Work.

D. For a change in Contract Time:

1. Fully describe the extent of and reasons for the change and effect of the change on the construction schedule, and attach a revised Progress Schedule. Take into account weekends, holidays, and the specified standard baseline for weather delays during the period of the requested extension.
2. For a change based on weather-related delay, provide and attach:
   a. applicable specified Weather Delay Reports, or, if none is specified, daily work logs that describe actual local weather conditions and their impact on progress.
   b. National Oceanic and Atmospheric Administration (NOAA) weather data, for corroboration.
   c. NOAA comparative data on normals, means, and extremes if such data or another weather baseline is not already provided in Contract Documents.

1.02 SIGNATURES for Change Order:

A. Form shall be similar in format and content to Section 01 26 40, and signed by authorized representatives of each of the entities required by Conditions of the Contract.

B. Normal procedure shall be that:

1. Designer prepares and submits supporting documents to Owner.
2. Owner produces and signs six (6) counterparts of form; transmits by fax, e-mail, or other means, informational copies to its Construction Representative, Designer, and Contractor; and forwards.
3. Owner's Construction Representative receives counterparts, and brings them to next Progress Meeting, unless urgency and opportunity make for a more timely execution.
4. Designer and Contractor both sign at Progress Meeting.

END OF SECTION

SECTION 01 26 40
FORM FOR AMENDMENT, CHANGE ORDER, OR DIRECTIVE

[ ] Amendment

[ ] Change Order

[ ] Construction Change Directive

Modification Number:

PROJECT:

Original Contract Date:
This Change initiated:

Project Number

The following changes in the Contract are hereby directed:

Item	Reference	Work	Contract-Sum	Contract-Time

The original Contract Sum	**$**
Net Change previously authorized	**$**
The Contract Sum prior to this Modification	**$**
This modification (*increases* / *does not change* / *decreases*) the Contract Sum	**$**
The new Contract sum, including this modification	**$**
This modification (*increases* / *does not change* / *decreases*) the Contract Time	
The new Contract Time, including this modification	
The last day of the Contract Time, including this modification	

CONTRACTOR	DESIGNER	OWNER
Signed	Signed	Signed
Name & Date	Name & Date	Name & Date
For	For	For

SECTION 01 26 50
FORMS FOR ITEMIZATION

Rounding off values is permitted on State contracts if rounding up for decreases and rounding down for increases. Embedded math functions without rounding are included in an Excel™ version of this form that can be downloaded from the website
http://www.tbr.state.tn.us/facilities/construction/forms.htm

Form for Itemization Summary

SBC Project Number:	Project Name:

Name of General Contractor:

Proposal Number:	Date Itemized:	Page of pages

Work by subs & sub-subs	Name of subcontractor	Costs & Allowances

Subtotal:	
5% additional OH&P allowed:	

Subtotal for general Contractor for Work by subcontractors:

Work by general Contractor:	

Subtotal (including subcontractors and the general Contractor)**:**

Bond Premium: % =

Total:

Form for Itemization of Class 1 Time-Related Expenses

SBC Project Number:	Project Name:
Work itemized below provided by:	
Proposal Number:	Date Itemized:	Page of pages

Description	Period Cost	Period (Year, Month, Week, Day)	Cost Per Day
Superintendent Salary			
Superintendent Vehicle			
General Use Vehicles			
_ _ _ _ _ _ _ _ _ _ _ _			
_ _ _ _ _ _ _ _ _ _ _ _			
_ _ _ _ _ _ _ _ _ _ _ _			
Field Office			
Field Office Equipment			
Computer			
Fax machine			
Copier			
Typewriter			
Calculator			
Field Office Utilities			
Electricity			
Natural Gas			
Water Service			
Drinking Water			
Telephone Service			
On-Site Storage			
Shed			
Trailer			
Safety Program			
Cleaning			
Site Toilet(s)			
		Subtotal of Costs:	
		10% for Overhead:	
		Subtotal with Overhead:	
		5% for Profit:	
		Total per day:	

Form for Itemization of Work

SBC Project Number:	Project Name:

Work itemized below provided by:

Proposal Number:	Date Itemized:	Page of pages

Description	Material				Equipment				Labor			
	Quantity	Unit	Cost	Extension	Quantity	Unit	Cost	Extension	Quantity	Unit	Cost	Extension

Materials Subtotal			Labor Subtotal:	
	% Sales Tax =			% Mark-up =
Materials Total:		**Equipment Total:**	**Labor Total:**	

Subtotal of Costs of Materials + Equipment + Labor = $

10% Overhead allowed on costs = $

Subtotal of Costs + Overhead = $

5% Profit allowed on Costs + Overhead = $

Total for this change = $

SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Phases are normally set forth in the Agreement and in the Summary of Work specification, normally from 01 10 00 to 01 10 19, but may differ in this Project Manual.

B. Applications for Payment and the final statement of accounting are normally specified in sections from 01 29 00 to 01 29 99, such as OFD standard Section 01 29 76, but may differ in this Project Manual.

C. Allowances are normally specified in sections from 01 21 00 to 01 21 99, such as OFD standard sections 01 21 13 and 01 21 15. Allowances associated with Unit Prices are normally in sections from 01 22 00 to 01 22 99, such as OFD standard sections 01 22 13 and 01 22 15. The arrangement of sections may differ in this Project Manual.

1.02 FORM and APPROVAL

A. The form for schedule of values shall be AIA Document G703 Continuation Sheet.

B. If objected to by Designer, revise and resubmit to Designer's satisfaction prior to submitting application for payment. If during construction the total completed for payment purposes exceeds or is anticipated to exceed allocations, revise and resubmit a schedule of values such that no values of completed work exceed their allocations.

1.03 ALLOCATION OF VALUES

A. If the Work is divided into defined portions ("Phases"), intended to have distinct commencement, duration, or completion requirements, divide the allocation to correspond to the Phases, then within each Phase, subdivide the allocations as specified in the following paragraphs.

B. Provide at least these three line items to account for General Requirements:

1. Mobilization, staging, and general start-up costs.
2. Construction administration and temporary facilities, prorated over the course of the project.
3. Maintenance of Record Documents, prorated over the course of the project.

C. If sitework is included, other than minor sitework incidental to a building or major structure, include sitework in single line item or group of line items. Within the group, categorize site utilities, roads and parking, and appurtenances according to general type and physical separation. If allowances are stipulated in the Work relating to sitework, provide a line item for each such allowance, including quantity allowances associated with Unit Prices.

D. For each involved building or major structure:

1. If allowances are stipulated in the Work, provide a line item in the Schedule of Values for each allowance, including quantity allowances associated with Unit Prices.
2. Categorize by major trades or units of work corresponding to the current Progress Schedule, and relate to the Divisions and Sections of the Specifications.
3. Further subdivide as desired, but maintain a distinct and identifiable correspondence to this allocation.

E. Account for Modifications by incorporating them into the appropriate allocations, or with a line item for each, until incorporating each into the appropriate allocations for the final statement of accounting.

END OF SECTION

SECTION 01 29 76
APPLICATIONS AND CERTIFICATES FOR PAYMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS FOR ALL APPLICATIONS

A. FORM:

1. Use AIA Document G702 Application and Certificate for Payment.

2. Use AIA Document G703 Continuation Sheet itemized with the line items and values of the Schedule of Values accepted by the Designer, and values and percentages for each line item.

B. Materials suitably stored on-site but not yet incorporated into the Work may be claimed for payment; and, materials suitably stored off-site may be claimed for payment if documented in accordance with 1.02.B.6 below.

C. Calculation of Retainage and amounts withheld:

1. Credit for completed work and stored materials, and deductions for incomplete work, comprise the "Total Completed and Stored to Date". The "Total Completed and Stored to Date" shall not include the value of Punch List items that remain incomplete after Substantial Completion.

2. Retainage is calculated as a percentage of "Total Completed and Stored to Date": 5% prior to Substantial Completion; 2% after Substantial Completion; then, none at final payment.

3. Other amounts withheld (i.e., potential liquidated damages or in response to subcontractor claims of non-payment) are deducted from the resulting Current Payment Due.

D. SUBMITTAL:

1. Submit draft of each application by fax or otherwise to Designer and to the Owner's Construction Representative three (3) days prior to actual submittal. Submit each application to the Designer at Progress Meeting, Substantial Completion inspection meeting, final inspection meeting, or after the final inspection meeting.

2. Submit six (6) counterparts bearing original seals and signatures, each with required attachments and accompanying submittals, in accordance with other applicable articles of this Section.

1.02 Provide the following ATTACHMENTS AND ACCOMPANYING SUBMITTALS with each counterpart of each application for PROGRESS PAYMENTS

A. Stamped or embossed counterpart of Consent of Surety, if application makes a reduction in retainage.

B. Copy of:

1. Continuation sheets.

2. Visitor Log for the period covered by application.

3. Weather Delay Report for all calendar months completed and not previously submitted.

4. Progress Schedule, updated and current, indicating progress through the period covered by application and scheduled progress through completion of Work.

5. Shop Drawing Log for entire project through the period covered by application, if required.

6. For materials stored off-site:

a. Statement identifying where materials are stored, and assuring that materials are tagged to identify them for use in the project.

b. Bill(s) of sale for materials claimed that list(s) all items.

c. Certificate of insurance covering materials claimed, recognizing Owner's right to make claims.

1.03 APPLICATION FOR PAYMENT UPON SUBSTANTIAL COMPLETION

A. At the Substantial Completion inspection, submit application for payment, including appropriate reduction in retainage, with the following attachments:

1. Continuation sheets described in 1.01.A.2.
2. Stamped or embossed counterpart of Consent of Surety to Reduction in Retainage, using AIA Document G707A or a similarly formed letter.
3. Copy of the Use & Occupancy Permit (some jurisdictions have a different name for this document).
4. Copy of a document identifying to whom Contractor delivered the Operating and Maintenance Data Binders.
5. Documents required for materials stored off-site, if applicable, in accordance with 1.02.B.6.
6. Weather Delay Report for all calendar months completed and not previously submitted.

B. In order to reduce retainage below the amount corresponding to Substantial Completion, complete the prerequisites to Final Payment specified in the Section on Close-Out Procedures and below.

1.04 APPLICATION FOR FINAL PAYMENT

A. When requesting final inspection, submit a final application for payment with the following attachments:

1. Final Continuation sheets described in 1.01.A.2.
2. Counterpart of Contractor's Affidavit of Payment of Debts and Claims, using AIA Document G706.
3. Stamped or embossed counterpart of Consent of Surety Company to Final Payment, using AIA Document G707 or a similarly formed letter. If Contractor has listed exceptions in the G706 form, Surety's consent shall acknowledge such exceptions.
4. Certificate of insurance for products and completed operations to the effect of that required by 9.10.2(2) and 11.1.2.1.c of the Conditions of the Contract.
5. Written statement assuring of continued insurability to the effect of that required by 9.10.2(3) of the Conditions of the Contract.
6. Final acounting of the Contract Sum which appropriately allocates the entire Contract Sum to the Divisions of the Specifications. This may follow the same format as the Schedule of Values.
7. Copy of the Roof Warranty or warranties, if and as required on form exhibited as Section 01 78 36.
8. Copy of the Report of Subcontractors and Suppliers, on form exhibited as Section 01 78 88 or equal.
9. Copy of a document identifying to whom Contractor delivered the Project Data Binders.
10. Weather Delay Report for all calendar months completed and not previously submitted.

B. After the Designer has certified that the Work and needed modifications to the Contract are complete, and if instructed to do so by the Designer, submit a revised application.

1.05 CERTIFICATION

A. Designer, if in disagreement with the amounts claimed in an application, may either return application to Contractor for revision and resubmittal, or revise application by hand to indicate corrections Designer considers appropriate.

B. Designer, finding an application complete and correct, will certify the application and forward one copy to Contractor to indicate the action taken.

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.01 SCHEDULING AND ATTENDANCE

A. The Designer, in cooperation with the Owner and the Contractor, will schedule and administer a Pre-Construction Conference, periodic Progress Meetings, and other specially called or required meetings.

B. Representatives of the Owner and the Designer will attend.

C. Representatives of the Contractor, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents. In the case of the Contractor, the representative shall be one who is authorized to sign change orders.

1.02 PRE-CONSTRUCTION CONFERENCE

A. A Pre-Construction Conference will be scheduled and conducted at the project site prior to the issuance of the Notice to Proceed.

B. The Pre-Construction Conference shall be attended by the Contractor's:

1. (Office) Job Manager
2. (Field) Job Superintendent
3. Major subcontractors' representatives
4. Major suppliers' representatives
5. Others, as desired.

C. The Pre-Construction Conference is intended to be an opportunity for the Contractor to review administrative, procedural, and temporary facilities requirements of the Contract Documents, and to ask questions concerning the Work.

1.03 PROGRESS MEETINGS

A. Progress Meetings will be scheduled and conducted at the project site prior to the Contractor's submittal of an application for payment, or when deemed advisable by the Designer.

B. Progress Meetings shall be attended by the Contractor's:

1. (Office) Job Manager
2. (Field) Job Superintendent
3. Subcontractors' representatives, as befits the agenda
4. Suppliers' representatives, as befits the agenda
5. Others, as appropriate.

C. Progress Meetings are intended to be a monthly opportunity for the Contractor to review and submit applications for payment, and attachments, and for a general review of the progress of the Work, aimed at identifying and mitigating impediments to timely completion.

D. Progress Meetings will be scheduled and conducted until final completion.

END OF SECTION

SECTION 01 31 90
ADMINISTRATIVE LOGS

PART 1 - GENERAL

1.01 SUBMITTALS LOG

A. If any shop drawings, product data, or sample submittals are required by the Contract Documents, maintain a submittals log to record the status of submittals made to the Designer.

1. Submit three (3) copies with each application for payment.

2. Clearly identify the Project.

3. Record activities with respect to shop drawings, product data, samples, and such other submittals which are required by the Contract Documents.

4. Indicate for each submittal made to date:

a. Title or name, and type of submittal.

b. Date submitted to the Designer.

c. Date returned by the Designer.

d. General nature of the Designer's response.

1.02 VISITOR LOG

A. Maintain visitor log in the field office (or with the Project Superintendent when no field office is required) to record visits by all persons not a part of the Contractor's forces, materials suppliers, or subcontractors' forces.

1. Submit three (3) copies with each application for payment.

2. Clearly identify the Project.

3. Indicate:

a. Visitor name and affiliation.

b. Date of visit.

c. Time of arrival and departure.

END OF SECTION

SECTION 01 32 15
PROGRESS SCHEDULES and REPORTS

PART 1 - GENERAL

1.01 INITIAL PROGRESS SCHEDULE

A. Submit within 21 days of award of the Contract, and not later than the date of submission of the first application for payment. Clearly identify the Project on the schedule.

B. Outline the orderly progress of the Work as planned from the Notice to Proceed through Substantial Completion on the contractually required date. Categorize the Work by Phase (if Phases are specified), major work area, and distinct trade or team, and divide into individual activities of one month or less duration each. Provide an identifiable relationship to the schedule of values. Identify projected monthly progress, points of 50% completion and Substantial Completion, and other major milestones.

C. A bar chart or critical path method is acceptable, or other method which is approved by the Designer.

1.02 SUBMITTALS SCHEDULE

A. Submit with the initial Progress Schedule. Clearly identify the Project, and format in a manner similar to the initial progress schedule, utilizing the same method, or make a part of the initial Progress Schedule.

B. Identify submittals to be made. Show date for submission and date by which Designer should respond, allowing sufficient time for review.

C. Designer may require revision of schedule if times allotted for review are insufficient.

1.03 UPDATED PROGRESS SCHEDULE

A. Submit three (3) copies with each application for payment.

B. Clearly identify the Project. Format in a manner similar to the initial progress schedule, utilizing the same method.

C. Indicate:

1. Work as initially scheduled.

2. Actual progress through the period covered by the current application for payment.

3. Planned progress through Substantial Completion, including extensions of time made by change order or construction change directive.

D. If actual progress falls behind projections, show how the backlog is to be made up so that the Work will be completed on time.

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Requirements of this Section are in addition to the requirements of the General Conditions.

B. This Section includes procedures for processing:

1. Shop drawings.
2. Product data.
3. Office samples.
4. Sample Warranties.
5. Mock-up samples.
6. Certificate of compliance.

C. Submittals as approved do not constitute a change order.

D. Submit all submittals under Contractor's Transmittal letter. Include the following:

1. Project by title.
2. Contractor's contract number.
3. Work and products by Specification Section and Article number.

E. Resubmittals: When Architect requires that a submittal be resubmitted, comply with requirements of this section.

1. Identify changes made since the previous submittal.

F. Notify Architect in writing at time of submittal of deviations from the requirements of the Contract Documents.

G. Make all submittals far enough in advance of scheduled dates for installation to provide sufficient time for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.

1. Architect's Review Time: In scheduling, allow at least 10 working days for Architect's review.
2. Delays caused by the tardiness of the Contractor in preparing and forwarding submittals will not be an acceptable basis for an extension of the Contract completion date or for consideration of alternate products which do not meet the specified requirements of this Project Manual.
3. Include submittal dates in Construction Schedule. See Section 01 32 15.

H. Where used in the Contract Documents, the words "or equal" or "or approved equal" shall be defined as "refer to the substitution requirements" specified in the Instructions to Bidders.

1.02 SHOP DRAWINGS

A. Reproduction of any portion of the Contract Documents for use as submittals for Shop Drawings is not acceptable.

B. Submit Shop Drawings in a clear and thorough manner.

1. Title each drawing with Project name.
2. Identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.

C. Identify the following:

1. Requirements of the individual section of Project Manual.
2. Field measurements.
3. Field construction criteria.
4. Relation to adjacent or critical features of the Work or products.
5. Conformance of submittal with requirements of Contract Documents.

D. Each sheet of Shop Drawings shall be stamped and signed by Contractor before submitting to Architect. Certify compliance with requirements of Contract Documents.

E. Review by the Architect shall not relieve Contractor from his responsibility in preparing and submitting proper Shop Drawings in accordance with his current obligations.

F. All submissions which, in the opinion of the Architect are incomplete, contain errors or have not been checked or only superficially checked, will be returned unchecked by the Architect for resubmission.

G. Fabrication of products or start of work before required Shop Drawings are approved by Architect and returned to Contractor shall be at Contractor's risk.

H. Required Printing: One set of reproducible prints and three sets of copies unless quantity is otherwise noted in an individual specification section.

1. This procedure is to be followed for each submission of a drawing or group of drawings until they are finally approved by the Architect.

I. Prepare coordination drawings and fully coordinate same with other trades and contiguous work.

1. Working drawings for coordination shall be submitted as directed by the Architect.

2. Architect reserves the right to require the submittal and/or approval of composite coordination drawings prior to the release of an individual Contractor's Shop Drawing and/or fabrication drawing.

1.03 PRODUCT DATA

A. Submit only pages which are pertinent.

1. Mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number.
2. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.

B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

C. Stamp and sign each set of manufacturer's product data before submitting to Architect to certify compliance with Contract Documents.

D. Number of Copies Required: Submit the number of copies which are required to be returned plus two copies which will be retained by the Architect, but not less than four in any case.

E. Upon approval, one copy of the approved data will be returned to the Contractor for his file. Contractor should submit additional sets above the minimum if he desires more than one copy with the Architect's comments.

1.04 OFFICE SAMPLES

A. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified, indicating colors, textures and patterns for Architect's selection.

B. Submit samples to illustrate functional characteristics of products, including parts and attachments.

C. Approved samples which may be used in the work are indicated in the specification section.

D. Label each sample with identification required for transmittal letter.

E. Number Required: As specified in individual specification section.

1.05 MOCK-UP SAMPLES

A. Where mock-up samples and similar samples are indicated in the individual specifications sections, comply with requirements for "Office Samples", and

process transmittal forms for mock-ups to provide a record of activity.

1.06 SAMPLE WARRANTIES

A. Submit for approval, sample copies of all specific warranties required in excess of one year duration.

B. Include sample warranties with related shop drawing submittal. Shop drawing review will not start without warranty submittal nor will shop drawings be released for fabrication or installation until sample warranty is approved.

1.07 CERTIFICATES OF COMPLIANCE

A. Where required by the specific specification sections, submit "Certificates of Compliance" certifying that all materials used in the work comply with all specified provisions thereof.

1. Submit in the form of a letter or company standard forms.
2. If test reports are submitted with "Certificates of Compliance". Test reports shall include data or dates of testing and results of testing.

1.08 TEST REPORTS

A. Test reports certified by an independent testing laboratory must be made available upon request by Architect.

END OF SECTION

SECTION 01 41 15
BASIC REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 CODES AND REGULATIONS

A. The Regulatory Requirements used for Tennessee Board of Regents projects are listed below as a convenience and may not be inclusive of all that apply. Others may also apply. Comply with all pertinent codes, standards, regulations and laws.

	Document	Source	Phone
1.	2006 International Building Code	International Code Council, Inc. 500 New Jersey Avenue NW, 6th Floor Washington, D.C. 20001	(202) 370-1800
2.	2006 International Mechanical Code Rules of the Tennessee Department of Commerce and Insurance Division of Fire Protection Chapter 0789-02-02 Codes and Standards		
3.	2006 International Fire Code		
4.	2008 National Electrical Code	National Fire Protection Association 1 Batterymarch Park Quincy, Massachusetts 02169	(800) 344-3555
5.	2006 Life Safety Code (NFPA No. 101-2006) (NFPA Standards as listed in NFPA 1, Chapter 2 – excluding NFPA 5000)		
6.	2007 Tennessee Elevator Safety Board Rules Chapter 0800-3-4 Elevators, Dumbwaiters, Escalators, and other Lifts	Tn. Dept. of Labor and Workforce Development Div. of Boiler & Elevator Inspection Elevator Safety Board 3rd Floor Andrew Johnson Tower 710 James Robertson Parkway Nashville, Tennessee 37243	(615) 741-2123
7.	2007 Board of Boiler Rules Chapter 0800-3-3 Boiler Inspections		
8.	ASHRAE standard 90.1-2004 Energy Standards for Bldgs except Low-Rise Residential Buildings	American Society of Heating, Refrigerating & Air Conditioning Engineers 1791 Tullie Circle NE Atlanta, Georgia 30329	(800) 527-4723
9.	ASHRAE standard 90.2-2004 Energy-Efficient Design of New Low-Rise Residential Buildings		
10.	ASHRAE standard 62.1-2007 Ventilation for Acceptable Indoor Air Quality		
11.	Tennessee Chapters 0780-2-1, Electrical Installations 0780-2-2, Codes & Standards 0780-2-3, Plan & Spec Review 0780-2-18, Equitable Restrooms	Tn. Dept. of Commerce and Insurance Div. of Fire Prevention, Codes Enforcement Sec. 3rd Floor Davy Crockett Tower 500 James Robertson Parkway Nashville, Tennessee 37243-1162	(615) 741-7190
12.	ADA Title II, 28 CFR parts 35 and/or 36 or, when applicable to specific Student Housing projects,	U.S. Department of Justice Civil Rights Division, Disability Rights Section-NYA 950 Pennsylvania, NW Washington, DC 20530	(800) 514-0301
	Uniform Federal Accessibility Standards, Fed-Std-795, April 1, 1988	Architectural and Transportation Barriers Compliance Board ATTN: OCE Suite 1000 @ 1331 F Street NW Washington, D.C. 20004	(202) 272-5434 (800) 872-2253 Tracy @ ext 30
13.	and, for Title III applications within Title II sites or facilities, 2002 North Carolina Accessibility Code w/ 2004 Amendments	N.C.Dept. of Insurance P.O.Box 26387 Raleigh, North Carolina 27611	(919) 733-3901

END OF SECTION

SECTION 01 43 25
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 CONTRACTOR'S RESPONSIBILITIES

A. Employ and pay for the services of an independent testing laboratory, approved by the Designer, to perform specified services and testing. Employment of laboratory does not relieve Contractor's obligations to perform the Work of the Contract.

B. Coordinate and pay for inspections and testing required by law, ordinance, rules, regulations, orders, or approvals of public authorities as required by the Contract Documents.

1. Furnish copies of Products Test reports as required.

2. Furnish incidental labor and facilities to facilitate inspections and tests and for storage and curing of test samples.

3. Notify the lab sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

4. Make arrangements with lab and pay for additional samples and tests required for Contractor's convenience.

1.02 TESTING LABORATORY

A. Qualifications:

1. Meet "Recommended Requirements for Independent Laboratory Qualification", published by the American Council of Independent Laboratories, and Basic requirements of ASTM E 329 "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".

2. Be authorized to operate in the State of Tennessee.

3. Submit copies to the Designer of the report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during the most recent tour of inspection with the memorandum of remedies of any deficiencies reported by the inspection.

B. Duties and limitations of authority:

1. Perform specified inspections, sampling, and testing of materials and methods of construction and promptly submit five copies of the written report of each test and inspection to the Designer.

2. Laboratory is not authorized to release, revoke, alter or enlarge on requirements of the Contract Documents, approve or accept portions of the Work, or perform duties of the Contractor.

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 GENERAL

1.01 GENERAL QUALITY CONTROL

A. Maintain quality control over products, services, site conditions and workmanship, to produce work of specified quality.

1.02 WORKMANSHIP

A. Comply with industry standards except where more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship

B. Perform work by persons qualified to produce workmanship of specified quality.

1.03 MANUFACTURER'S INSTRUCTIONS

A. When specification sections require that installation of work shall comply with manufacturer's printed instructions, a copy of the instructions shall be maintained at the project site during installation and until completion and acceptance.

B. Handle, install, connect, clean, condition, adjust and finish products in strict accordance with such instructions and comply with specified instructions.

1. Should project conditions or specified requirements conflict with manufacturer's instructions review with the Architect for further instructions.
2. Do not proceed with work without clear instructions.

1.04 MANUFACTURER'S CERTIFICATES

A. When required by specified sections, submit three copies of manufacturer's certificates that certify the products meet or exceed specified requirements.

1.05 MANUFACTURER'S FIELD SERVICES

A. When specified in specification sections, require supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up equipment, test, adjust, and balance of equipment as applicable.

B. Submit manufacturer's written report listing observations and recommendations to the Architect.

1.06 TESTING AND INSPECTION SERVICES: See Section 01 43 25.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 PROJECT CONDITIONS

A. This Section is not intended to limit types and amounts of temporary construction facilities and controls required. Omission from this Section will not be accepted as an application that such temporary activity is not required for successful completion of the work and compliance with requirements of the Contract Documents.

B. Provide and maintain each temporary construction facility and control when required for proper performance of the work. Terminate and remove when no longer needed or when permanent facilities, with proper authorization, are available for use.

C. Obtain and pay for all required applications, fees, permits and inspections required for temporary construction facilities and controls.

D. Install, operate, maintain and protect temporary construction facilities and controls in a manner and at locations which are safe, non-hazardous, sanitary and adequately protect project work, workmen and the public.

1.02 COST OF CONSUMED UTILITIES

A. Water Service Use Charges: Water consumed during construction is to be metered and paid for by the Owner.

B. Electric Power Service Use Charge: Cost of electric power consumed during construction is to be metered and paid for by the Owner.

1.03 REQUIREMENTS OF REGULATORY AGENCIES

A. Provide and maintain all temporary facilities in compliance with governing rules, regulations, codes, ordinances and laws of agencies and utility companies having jurisdiction over work involved in project.

B. Be responsible for all temporary work provided, and obtain any necessary permits and inspections for such work.

C. Contractors shall confine equipment, storage of materials, and operation of workmen to the limits indicated or directed and shall abide by law, ordinances, conditions stated in permits and directions of the Architect.

D. Do not interfere with normal use of roads in vicinity of project site except as indicated or as absolutely necessary to execute required work, and then only after

proper arrangements have been made with authorities having jurisdiction, including traffic control as applicable.

1.04 SPECIAL PRECAUTIONS AND REQUIREMENTS

A. Do not interfere with normal use of occupied areas in existing (adjacent) buildings, existing driveway access to existing adjacent buildings and existing building utility services, except as absolutely necessary to execute required work involving such facilities, and then only after proper arrangements have been made through the Owner with persons in charge of existing facilities.

B. Do not block required exits from existing buildings.

1.05 TEMPORARY FIELD OFFICES, TRAILERS AND TELEPHONE

A. Provide and maintain clean weather tight offices at the site for own use and the Architect and at which location he/she or his/her authorized agent shall be present, or to which either may be readily called at all times while the work is in progress.

1. Provide field office heated, lighted and provide with telephone service. All expenses in connection with the field office, including the installation cost and use cost of heat, air conditioning, light, water and janitor service.

B. Copies of permits, approved shop drawings, plans and specifications marked up-to-date with all revisions and all addenda shall be kept at said offices areas ready for use at all times.

C. All expenses in connection with Contractor's field offices, including the installation cost and use of telephones, shall be borne by the Contractor.

D. Maintain field office areas until final acceptance and then remove, unless the Architect orders or approves earlier removal.

E. Pay all costs, including utility installation costs to the field office.

F. Provide and maintain such additional storage trailers on the project as required. Located where directed by the Architect.

G. Contractor may be required to relocate their offices, as directed by Architect, during construction as work progresses.

1.06 TEMPORARY SANITARY FACILITIES

A. Provide temporary portable toilets, acceptable to public health authorities, as required to service the project. Maintain in a clean, sanitary condition. Locate as directed by Architect.

1.07 TEMPORARY WATER SERVICE

A. General: Water is available from water main indicated on site drawings.

B. Arrange for, provide and pay for temporary water connections to water main, installation of metered extension and suitable fixtures at termination of lines.

C. Provide sufficient branch lines of adequate size to serve the needs of all trades. Locate water supplies at convenient locations, as directed by Architect.

D. Provide insulated housings for temporary service lines to protect against freezing, when applicable.

1.08 TEMPORARY HEAT AND VENTILATION

A. Prior to permanent enclosure of the structure, provide temporary heat as necessary to complete the work.

1. Provide weather protection as required to carry on work during inclement weather and to protect work and materials from damage by weather.
2. Protection of work includes covering, temporary enclosures, heating materials and work under construction and for providing suitable working conditions.
3. Furnish temporary heat by Owner approved types of units or equipment which is safe, will not affect surrounding areas of Contract Work and is properly supervised while in use.

B. "Permanently enclosed" shall mean that permanent walls and roofs are in place and weather tight, windows are in place and glazed and all entrance enclosures are either permanently in place or provided with suitable temporary enclosures.

1. Polyethylene sheet is not considered a suitable temporary enclosure. One-half inch thick plywood tightly fit, sealed and supported and maintained can be considered a temporary enclosure.

C. After the structure is permanently enclosed, provide, operate and maintain until substantial completion, approved temporary heating and ventilating units to maintain that portion of the structure at suitable temperature and humidity conditions to complete the work.

1. Arrange temporary units to bring in sufficient outdoor air to ventilate the structure and to prevent build-up of harmful dusts and fumes and to remove excess moisture. During warm weather, provide an adequate supply of fresh air, when necessary, to properly ventilate moisture, dust, fumes from paints, cements or adhesives in tightly-enclosed areas where natural ventilation will not be sufficient.
2. Provide temporary heating and ventilating as follows:
   a. During normal working hours, minimum 50^{o} F.
   b. During placing, setting and curing of concrete, minimum 50^{o} F.
   c. For 10 days prior to placing interior finish materials and throughout interior finishing, painting, etc., and until final acceptance of work and occupancy by Owner, minimum 70^{o} F.
   d. Supply heat and ventilation in a manner which avoids rapid drying of material but permits material and building to dry so remaining

moisture will not affect finish material.

e. Operate temporary systems each day, including Saturdays, Sundays and holidays. Include necessary labor and approved operating personnel.

f. Supply all fuel required for temporary heating and ventilating, including all material, labor and supervision to connect same.

D. When permanent systems are used for temporary construction use, Contractor shall assume full responsibility for maintaining such equipment during and after use. Included in maintenance are the following:

1. Proper operation and maintenance of the mechanical equipment until acceptance of the project by Owner.
2. Maintenance of temporary filters in all equipment to prevent accumulation of dust and dirt in coils, housings and ductwork.
3. Prior to final inspection; replacement of temporary filters with new filters, thorough cleaning of coils and other equipment, putting entire system into first class condition, cleaning traps and devices, adjustment and removal of any and all materials and equipment not functioning properly.
4. Owner and Architect must be given access to and opportunity to inspect equipment and maintenance procedures at all times. Owner involvement will not relieve the Contractor from the responsibilities specified herein.

E. Use of permanent heating or cooling and ventilating equipment for temporary construction use shall not effect warranty. Warranty shall take effect at time of project acceptance by Owner.

F. Cost of Temporary Heat: Cost of all fuel consumed in conjunction with temporary heat or permanent system used for temporary heat shall be paid by the Contractor.

1. Electric resistance type heating units are not permitted.

G. During periods of extremely low temperatures when water pipes could possibly freeze or when such conditions are forecast, temporary heating must be monitored 24-hours a day, 7 days a week.

1.09 TEMPORARY LIGHT AND POWER

A. Provide necessary temporary electrical service and temporary wiring and outlets as required to meet project needs for temporary lighting and power at the start of the project, as work progresses and until acceptance by the Owner, excluding power to individual contractor's trailers.

B. Extend temporary service from public utility service. Provide meter and extend service with disconnect to central location on site and to electric panel board location near Contractors' office trailer area. Provide system sized as required to service project construction needs.

C. Construct temporary pole line as required.

D. Remove temporary service, light and power system when permanent services and systems are available for use. No temporary system component shall form a part of the permanent systems.

E. Electrical work for construction purposes shall conform to Federal, State and local safety requirements, as well as requirements of the National Electrical Code. Obtain and pay for required applications, permits and inspections pertaining to this work.

F. Provide all lamps required to service the project. Replace lamps and fuses throughout the life of the project.

G. Pay all costs for installation, maintenance, supervision and removal of temporary light and power systems.

H. Make connections for temporary heat. Check temporary heat requirements.

I. Temporary Lighting

1. Provide as required to service the project.
2. As interior partitions are erected, revise the temporary lighting arrangements so that not less than one lamp is provided in each space over 70 square feet in area. Lights shall also be installed, as directed by Architect, in smaller areas where required to provide adequate light for work being carried out in the space.

J. Both 240 volt and 120 volt power receptacles are required on the project.

1.10 CONSTRUCTION AIDS

A. Hoists and Cranes: Erect and maintain adequate hoisting facilities as required for the work.

B. Shoring and Bracing: Provide all shoring and bracing required for safety and proper execution of their work. Remove these items when the work is completed.

C. Temporary Partitions: Provide temporary dustproof, security partitions in corridors, door openings and wall openings separating new work from existing building. Construction methods and materials shall be approved by Architect prior to construction of partition. However, construction shall be similar to plywood sheathing over wood studs with 6 mil plastic film applied over sheathing sealing all joints. Seal partitions at floor, walls and ceilings.

1. Provide doors through temporary partitions with self closing devices and locks.

1.11 WEATHER PROTECTION

A. Protect work and existing or adjacent property against weather, to maintain work, materials, apparatus and fixtures free from injury or damage during the entire

construction period. Work likely to be damaged shall be covered or protected at the end of each day's work. Any work damaged by failure to provide protection required, shall be removed and replaced with new work at the Contractor's expense.

B. Remove all snow and ice as may be required for proper protection and execution of the work and protection and safety of the public.

C. Provide winter weather closures and temporary doors at all unclosed openings.

1.12 WATCHMAN SERVICE

A. If Contractor considers watchman services necessary or desirable for protection of his/her own interest, such services may be employed at his/her own complete expense.

1.13 SAFETY

A. Safety requirements shall be in accordance with the General Conditions.

B. Provide and maintain guard lights at all barricades, railings, obstructions in the roadways or sidewalks and at all trenches or pits adjacent to walks or roadways.

C. Strict attention and full adherence must be given the Williams-Steiger Occupational Safety and Health Act of 1970, U.S. Department of Labor.

1.14 SECURITY CONDITIONS

A. Security of building must be maintained during "non-standard" working hours (premium time). This includes, but is not necessarily limited to, verifying all entrance doors and windows are secured.

B. Contractor shall be responsible for all infractions of rules and regulations by his workers.

C. Loitering or wandering through the corridors and into rooms not connected with the project or into other buildings on site will not be permitted.

D. Erect a 6 foot high fence with gates to enclose construction site from all or part of the campus, provide:

1. Wire mesh (farm fence) or chain link type fabric with steel posts.
2. Locate where directed by the Owner
3. Provide metal gates, of same fabric as metal fence, where indicated.
4. Maintain fence and gates in working order at all times.
5. Except during working hours, keep gates locked at all times.

1.15 DUST CONTROL

A. Control dust originating within project limits using water or a dust palliative

acceptable to the Architect. When conditions create blowing dust and dirt that is considered higher than that normally encountered, Contractor shall cooperate with Architect in determining methods to help minimize blowing. This may involve, as a minimum, more frequent applications of dust palliative. Calcium chloride may not be used.

1.16 TEMPORARY SIGNS

A. Temporary Project Sign

1. Provide project sign approximately 4 feet by 8 feet.
2. Painting by professional sign painter, with text, design, layout and colors as directed by Architect.
3. Materials: 3/4" APA-AB-EXT. Plywood for sign face with pine or fir trim. Provide 4 x 4 treated wood posts of sufficient length and quantity to securely brace and support sign against wind pressure.
4. Locate sign as directed by Architect. Maintain until completion of project, then remove. Erect sign a minimum of 8 feet from public right of way.

B. Temporary Directional Signs: Provide as required to adequately direct traffic and personnel on site.

1.17 STREETS AND TRAFFIC

A. Cleaning and Repair

1. Contractors shall remove mud and spillage from public walks, streets and sewers without delay. Failure to clean areas promptly will result in areas being cleaned by the Owner at the responsible Contractor's expense.
2. Damage to roads or other facilities on the grounds, resulting from hauling, storage of materials, or other activities in connection with the work shall be repaired or replaced, at no expense to the Owner, by the Contractor causing the damage. Repairs or replacements shall be made to the satisfaction of the Architect.

B. Traffic

1. Notify local law enforcement agency at least two weeks in advance of any anticipated work affecting traffic flow.
   a. To assure maintenance of flow and to safeguard all parties involved in planning to maintain flow, a field inspection should be made jointly by the Architect and Contractor personnel before performing any work which would interrupt normal traffic patterns.
   b. Re-routing of traffic shall be planned, as to route and direction, in cooperation with the local law enforcement agency.

1.18 PARKING

A. Employees of Contractors and subcontractors must park vehicles in areas assigned to them. Parking on streets or in restricted areas is prohibited.

1.19 FIELD ENGINEERING

A. Employ a registered surveyor, registered in the State of Tennessee to lay out the building on the site and to locate and fix all site items such as site improvements and utilities and furnish a certified plat of this work.

B. Be responsible for accuracy of all lines, elevations and measurements of the work.

C. Exercise proper precaution to verify dimensions shown on Drawings before layout of the work.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Requirements of this Section apply to the Work of all other Sections.

B. Section Includes:

1. Transportation and Handling.
2. Storage and Protection.
3. Standards.
4. Manufacturers and Types.
5. Fabrications.
6. Shop Priming.
7. Prohibited Materials and Methods.

1.02 RELATED SECTIONS

A. Quality Control: Section 01 45 00.

B. Cutting and Patching: Section 01 73 29.

C. Shop Drawings, Product Data and Samples: Section 01 33 23.

D. Execution Requirements: Section 01 73 00.

1.03 STANDARDS

A. Standards, codes and regulations published by Manufacturer's Associations, governmental agencies and other regulatory authorities form a part of these Specifications as minimum requirements. Such references include the latest issue and all amendments up to 30 days prior to the Bid Date.

B. "Governing Authority" means all federal, state and local laws and regulations.

C. Where differences occur between the Contract Documents and such standards, the most restrictive requirement shall apply.

D. Supply all materials and perform all work in accordance with the Manufacturer's Specifications and installation procedures, and in conformance with published trade and manufacturer's association standards, unless specifically noted otherwise herein.

1.04 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site.

1. Transport products by methods to avoid product damage.
2. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
3. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and accepted submittals, and that products are properly protected and undamaged.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

1.05 STORAGE AND PROTECTION

A. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

B. Store products in accordance with manufacturer's instructions with seals and labels intact and legible.

1. Store products subject to damage by the elements in weathertight enclosures.
2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

C. Exterior Storage

1. Store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. Cover products which are subject to deterioration with impervious coverings.
   Provide adequate ventilation to avoid condensation.
2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign materials.

D. Arrange storage in a manner to provide access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage.

E. Protection After Installation: Provide coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

PART 2 PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS

A. Products include materials, equipment and systems.

B. Products incorporated into the work:

1. Comply with specifications and referenced standards as minimum requirements.
2. Manufactured and fabricated products:
   a. Design, fabricate and assemble in accordance with the best engineering and shop practices.
   b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
   c. Two or more items of the same kind shall be identical, by the same manufacturer.
   d. Products shall be suitable for service conditions.
   e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing by the Architect.
4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.
5. New and unused, except as otherwise indicated.

2.02 MANUFACTURERS AND TYPES (MODELS)

A. In some instances the Project has been designed around a specific manufacturer. In some sections of the specifications, other manufacturers are listed as acceptable. Equipment or materials from these manufacturers will be acceptable contingent upon their meeting the design, appearance and functional standards established by the specified items. If equipment or a material of an acceptable manufacturer requires changes; electrically, mechanically, structurally, from what is indicated on the drawings, it shall be the responsibility of the Contractor requiring such change, to pay all costs involved with no additional costs to the Owner.

B. Where more than one manufacturer or specific product is listed, provide any one named. No substitutions will be permitted after signing the contract.

C. Equivalent components (articles, devices, materials, forms of construction, fixtures, etc.) may be submitted to the Architect for approval prior to bidding regardless of listed manufacturers.

D. Where a performance is specified and no manufacturer is listed, submit through the Shop Drawing procedure the name of the manufacturer, the product proposed, and detailed information showing its characteristics. Such proposal shall meet or exceed the specification, line item by line item, or be rejected.

E. Where a choice of color, pattern, or texture is available for a specified product or item of equipment, the Architect will make a selection from the manufacturers highest or best, unless noted otherwise in the specifications.

2.03 FABRICATION

A. Fabricate all items in the shop insofar as practicable. Where items cannot be completely shop fabricated and assembled for shipment, assemble and fit in shop, disassemble and ship. Identify parts for field assembly.

B. Fabricate items to be straight, square, in proper alignment, and with hairline joints where joints are necessary and permitted. Pre-plan field joints to be as inconspicuous as possible; coordinate locations with Architect.

2.04 SHOP PRIMING

A. Shop prime or seal surfaces of all products to receive paint materials in accordance with the requirements of Section 09 91 00.

B. Apply a primer or sealer compatible with the specified paint materials.

C. In the event such a primer is determined to be incompatible with the specified finish paint system, provide a barrier coat or remove the primer and reprime as directed, at no additional cost to the Owner.

2.05 PROHIBITED MATERIALS AND METHODS

A. The following items are expressly prohibited:

1. Attachment Related Items
   a. Powder Fasteners: Powder fasteners are defined as anchors which are driven into place by any device which produces an impact force by use of a powder charge, compressed air, gas or any other propellent. Powder fasteners prohibited for the following conditions:
      1) Attachment of structural members.
      2) Where public may be endangered by misuse.
   b. Plug anchorage by use of wood, lead or plastic.
   c. Perforated steel strap iron for pipe or other support or anchorage.
   d. Suspension systems that are not independently supported.
      1) Ceiling grid systems shall not be supported from ductwork, electrical conduit, heating or plumbing lines, and vice versa.
      2) Each utility system and the ceiling system shall be a separate installation, each independently supported from the building structure.
      3) Where interference occurs, provide trapeze type hangers or other suitable supports for each system.
      4) Locate hangers and supports where they will not interfere with access to mixing boxes, fire dampers, valves, and other appurtenances requiring servicing.
2. Methods Related Items
   a. The penetration of floors and walls by pipes, ducts, or other penetrations unless openings are appropriately fire stopped by fire doors or fire dampers, and voids around pipes, ducts, conduits, etc. are sealed with fireproof materials.
   b. The use of ink marking pens on surfaces of any kind of materials receiving paint or other finish in exposed location.

3. Materials Related Items
   a. Asbestos or asbestos containing materials.
   b. Barbed wire in construction fencing.
   c. Water soluble treatment of insulation jackets or facings, to impede or retard smoke or flames.
4. Door Related Items
   a. Knock-down (KD) door frames.
   b. Thresholds raised more than 1/2" at doors indicated as wheel chair accessible.

PART 3 EXECUTION

Not Applicable

END OF SECTION

SECTION 01 62 25
PRODUCT OPTIONS and SUBSTITUTIONS

PART 1 - GENERAL

1.01 ENVIRONMENTAL HAZARDOUS PRODUCTS, MATERIALS, OR WASTES

A. Do not incorporate in the Work hazardous materials or products as currently defined in the Resource Conservation and Recovery Act of 1976 (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), or Environmental Protection Agency (EPA) regulations, rules, or requirements, as amended, unless the Contract Documents give no other option than to provide a material or product which contains a hazardous material, component, constituent, waste, or leachate. In studying the Contract Documents and carrying out the Work, report at once to the Designer the discovery of a product or material which contains hazardous materials, components, constituents, waste, or leachate.

B. Do not incorporate in the Work a product or material which contains concentrations of a constituent, component, or material above the threshold levels which would require adherence to hazardous waste disposal regulations as currently defined, or could cause a release or threat of release of a hazardous substance at a level that would require a remedial response or removal action as currently defined by RCRA, CERCLA, or the EPA.

C. Select materials and products meeting specified requirements which comply with EPA requirements as regards hazardous materials content. In making requests for substitutions, determine that materials and products proposed for substitution comply with RCRA, CERCLA, and EPA requirements.

1.02 SUBSTITUTIONS:

A. Requests for substitutions shall be submitted to Designer on the form exhibited as Section 01 62 32, or in a similar format which provides the same or more information. Substitute products should not be ordered and shall not be installed without written approval or acceptance from Designer. Contractor assumes all risks associated with premature ordering and installation of substitute products.

B. The specifically named manufacturers, products, and systems, and descriptive characteristics used in the Contract Documents normally serve only to establish a level of quality and a performance standard. Unless specific restriction is placed upon an item in the specifications, Contractor may submit proposals for substitutions. The Owner reserves the right to disallow substitutions. Contractor assumes risks associated with possible rejection of proposals for substitution submitted during the life of the contract.

C. Delays caused by tardiness of Contractor in preparing and forwarding submittals do not constitute an acceptable basis for consideration of substitute products. Delays due to factors which were in effect prior to project bidding do not constitute an acceptable basis for consideration of substitute products.

D. When making requests for substitutions, Contractor assumes the following reponsibilities:

1. To have personally investigated the proposed substitute product and determined it is equal or superior in all respects to that specified;
2. To provide the same warranty for substitute that Contractor would for that specified;
3. To provide complete cost data, and waive all claims for additional costs related to substitution which subsequently become apparent; and
4. To coordinate installation of the accepted substitute, making such changes as may be required for Work to be complete in all respects.

END OF SECTION

SECTION 01 62 32
SUBSTITUTION REQUEST FORM

To:	**Project:**
Attn:	
Specified Item:	**Proposed Substitute:**

1. The following are attached (Mark all that apply):

☐ **Complete Description** ☐ **Catalog**
☐ **Laboratory Tests** ☐ **Spec Data**

2. This substitution will have the following effects on dimensions, guages, weights, etc.:

3. This substitution will have the following effects on wiring, piping, ductwork, etc.:

4. This substitution will have the following effects on other trades:

5. This substitution will have the following effect on construction Schedules:

6. The proposed substitute(s) differs from the specified product(s) in quality and performance as follows:

7. Manufacturers guarrantees for the substitute(s) and the specified product(s) are (check one):

☐ **the same** ☐ **different** (if different, explain below)

8. Information on the availability of maintenance services and replacement materials for proposed substitute(s) is provided on an attached sheet if applicable. This attachment is:

☐ **attached** ☐ **not applicable**

9. Names, addresses, and phone numbers of fabricators and suppliers for proposed substitute(s) are provided on an attached sheet if applicable. This attachment is:

☐ **attached** ☐ **not applicable**

10. If the proposed substitution is accepted, it will result in:

☐ **no cost impact** ☐ **a cost increase of**

☐ **a cost decrease of** _____

(If change in cost is indicated, itemization on specified Cost Itemization Form is attached)

11. License fees or royalties are pending on the proposed substitute.

☐ **No** ☐ **Yes** (if yes, explain below)

12. The undersigned or the firm represented shall pay for additional studies, investigations, submittals, redesign, and analysis by the Designer necessitated by this substitution request.

Substitutions must be requested in accordance with applicable Contract requirements. After bidding, substitutions are to be submitted only by Contractor. Substitute products should not be ordered or installed without written acceptance.

Submitted by: **Date:**

Sign here: _____ _____

Name: **Telephone:**

type or print: _____ _____

for:

Name of firm: _____

Address:

Street address: _____

and mailing address if different: _____

City, State, and Zip Code: _____

Designer's Review Comments:

☐ **Accepted** ☐ **Rejected**

☐ **Accepted as noted** ☐ **Rejected (received too late)**

☐ **Rejected (submittal incomplete)**

Additional comments:

For the Designer: **Date:**

Signature here: _____ _____

SECTION 01 73 00

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Requirements of this Section apply to the Work of all other Sections.

B. Section Includes:

1. Examination of Substrate.
2. Preparation.
3. Installation.
4. Workmanship.
5. Protection.
6. Overhead Attachments.

1.02 RELATED SECTIONS

A. Quality Control: Section 01 45 00.

B. Cutting and Patching: Section 01 73 29.

C. Submittal Procedures: Section 01 33 23.

D. Product Requirements: Section 01 60 00.

1.03 STANDARDS

A. Standards, codes and regulations published by Manufacturer's Associations, governmental agencies and other regulatory authorities form a part of these Specifications as minimum requirements. Such references include the latest issue and all amendments up to 30 days prior to the Bid Date.

B. "Governing Authority" means all federal, state and local laws and regulations.

C. Where differences occur between the Contract Documents and such standards, the most restrictive requirement shall apply.

D. Supply all materials and perform all work in accordance with the Manufacturer's Specifications and installation procedures, and in conformance with published trade and manufacturer's association standards, unless specifically noted otherwise herein.

1.05 NON-CONFORMING WORK

A. Faulty work or work not in conformance with the Contract Documents will not be permitted by the Architect.

1. It is the responsibility of the Contractor to propose a remedy by means of detailed drawings and written documentation and submit such documentation to the Architect for comments.
2. All costs for the removal and reconstruction of such work, as well as additional services of the Architect, shall be paid for by the Contractor.

PART 2 PRODUCTS - NOT APPLICABLE

PART 3 EXECUTION

3.01 EXAMINATION OF SUBSTRATE

A. Examine the substrates or structure to which a product is to be applied or installed. Do not proceed until unsatisfactory conditions have been corrected. Starting the work indicates acceptance of conditions and the installer assumes full responsibility for results.

B. Check the substrate or structure for proper tolerances and clearances. Tolerances are listed under individual specification Sections.

3.02 PREPARATION

A. Substrate: Where the products are applied to a substrate, prepare the substrate as recommended by the product manufacturer. That generally includes the following:

1. Bringing substrate to a uniform surface by smoothing uneven surfaces and filling holes, cracks and depressions with recommended filler or compatible type material.
2. Depressed Slabs: Bring to required elevation to receive finished materials where finished materials cannot completely fill depression. Use approved cementitious filler or compatible type material. Coordinate depressed slab locations with finish material locations.
3. Remove substances such as dust, oils and other foreign matter, not compatible with the product.
4. Surfaces shall be dry, unless moisture content or wetting requirement is specified or recommended.

B. Concrete Slabs: Provide steel shot abrasive cleaning of concrete slabs receiving designated finish flooring materials.

1. Designated Finish Flooring Materials
   a. Cementitious or cementitious set materials.
   b. Sheet flooring materials.
   c. Waterproofing materials.
   d. Paint materials.

e. Polymer or epoxy type seamless flooring.

2. Equipment: Electric powered portable unit with self-contained dust collection system. Size(s) of unit(s) and shot media suitable for conditions and proposed finish materials. WHEELABRATOR CORP. (800/544-4144) "Blastrac" or similar type system by SASE COMPANY INC. (800/522-2606), BW MANUFACTURING (616/447-9076) or INNOVATECH (800/267-6682).
3. Cleaning: Remove concrete surfaces to sufficient depth to remove bond breakers and contaminants such as curing compounds, oils, and other foreign matter which may be detrimental to the completed flooring installation.
   a. Work smoothly and evenly over entire surface; avoid creating dips, ridges, or other imperfections which would show or telegraph in the completed installation.
   b. Small transitions for different flooring materials may be obtained by multiple passes if carefully executed to create smooth even slope of not more than 1/8" in 2 feet.
4. Clean floor as near as possible to flooring installation to avoid contamination from work of other trades. Protect clean floor from soiling with suitable sheet materials. Reclean soiled areas.

C. Inserts and Anchorages

1. Anchorages where not detailed are the responsibility of the installer to design a suitable connection, structurally sound, and aesthetically acceptable to the Architect. Furnish calculations, drawings and product data when requested by the Architect. Such information may or may not be returned as indicated in Section 01 33 23.
2. It is the responsibility of the installer to furnish built-in fastening devices for his/her product to the proper trade for installation as the work proceeds.
3. In the event such devices are not furnished in time to be built-in, it is the installer's responsibility to provide other methods for attaching their product. Submit drawings and other required data to the Architect.

D. Templates: Provide templates, diagrams and other coordinating documents to the proper Contractor, manufacturer or supplier of related items affecting the Work.

E. Dimensions

1. If the exact location of an item is not indicated by dimension on the Drawings or noted in the Specifications, the Architect reserves the right to determine such location in the field prior to roughing-in.
2. If the exact dimensions of a product are not indicated, the Architect reserves the right to determine dimensions prior to the ordering or fabrication of a product.
3. Such dimensional changes shall not be a basis for changes in the Contract Sum.
4. Where miscellaneous devices, such as thermostats, switches, controls, grilles, pipes, or outlets of any nature are not specifically located by the Contract Documents, request such location or obtain approval of the

location prior to installation. If approval has not been obtained, the Architect may direct the relocation of such devices at the expense of the installer.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's recommendations or the requirements of trade associations, listed standards, Shop Drawings and Contract Documents.

B. If a conflict exists between these references, the most strict requirements govern. If printed instructions are not available, consult with the manufacturer or the manufacturer's field representative, where applicable.

C. Provide hangers, auxiliary framing, and other means for installing ceiling suspension systems, lighting fixtures, diffusers, and other equipment in ceilings to avoid ductwork, piping, etc.

1. Suspend from structural members (i.e. joists, beams, etc.), and not from ductwork or piping.
2. Provide supplemental framing members (i.e. angles, tubes, light gage steel framing, etc.) to span between structural members where required to support items of this paragraph C.

D. Install work that will not interfere with the proper installation of the Work of other trades.

E. Install work in a manner to facilitate operating, servicing and repairing.

F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

G. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.04 WORKMANSHIP

A. Install products straight, plumb, level and in line. Securely attach items to the substrate, using recommended adhesives, mechanical fasteners or other devices. Where holes are provided for attachment, do not field drill or cut new holes without the approval of the Architect.

B. Where applicable, match finished work to the approved samples or mock-ups.

C. Conceal fasteners wherever possible, unless exposed fasteners are permitted or specified.

D. Weld in accordance with AWS standards; comply with AWS for qualifications of

operators and for workmanship.

E. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

F. Recheck measurements and dimensions, before starting each installation.

3.05 PROTECTION

A. Protect finished surfaces of product being installed and surrounding products from damage during installation. Provide protective devices as required and as recommended by the manufacturer. Cover work subject to damage at the end of each day's work.

B. Coat concealed surfaces of metal products with a bituminous or other approved coating to prevent contact between dissimilar metals or other material which can cause deterioration.

C. Correct damage by repairing or replacing as directed by the Architect. Repairing will be permitted only where the repair is undetectable and does not cause structural damage or interfere with proper functioning of the part.

D. Protect finish of installed products until Substantial Completion of the Project by use of wrappings, covers or other approved protective devices. Remove such protection immediately prior to final cleaning.

E. Limiting Exposures: Coordinate and supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.06 OVERHEAD ATTACHMENTS

A. Where overhead hangers are required, and not indicated on the drawings, provide one or more of the following as required:

1. Concrete inserts prior to placement of concrete or drilled type inserts after concrete is placed.
2. Trapeze from adjacent structure with suitable steel framing.
3. Connections to Structure: Suitable anchorage devices with a minimum load carrying capacity of 250 pounds plus safety factor of 4:1 for the applied load.
    a. Concrete: Steel expansion anchors. See Prohibited Material and Methods specified in Section 01 60 00.
    b. Steel: Bolted or welded connections to steel structure.

B. Where metal deck is furnished with hanger tabs or similar devices, applied total load, including work of other trades, not to exceed 75 pounds for each device. Loads in excess of permitted limit to be supported by trapeze framing as specified

above.

C. Verify support requirements of heavy or unusual loads not specifically shown on drawings with Architect.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 GENERAL

1.01 DESCRIPTION

A. Execute cutting, fitting or patching of Work, required to:

1. Make several parts fit properly.
2. Uncover Work to provide for installation of ill-timed Work.
3. Remove and replace defective Work.
4. Remove and replace Work not conforming to requirements of Contract Documents.
5. Remove samples of installed Work as specified for testing.
6. Install specified Work in existing construction.

B. In addition to contract requirements, upon written instructions of Architect:

1. Uncover Work to provide for Architect's observation of covered Work.
2. Remove samples of installed materials for testing.
3. Remove Work to provide for alteration of existing Work.

C. Do not endanger any Work by cutting or altering Work or any part of it.

1.02 SUBMITTALS

A. Prior to cutting which affects structural safety of Project, submit written notice to Architect, requesting consent to proceed with cutting, including:

1. Identification of Project.
2. Description of Affected Work.
3. Necessity for cutting.
4. Affect on other Work, on structural integrity of Project.
5. Description of proposed Work. Designate:
    a. Scope of cutting and patching.
    b. Contractor and trades to execute work.
    c. Products proposed to be used.
    d. Extent of refinishing.
6. Alternative to cutting and patching.

B. Should conditions of Work, or schedule indicate change of materials or methods, submit written recommendation to Architect, including:

1. Conditions indicating change.
2. Recommendations for alternative materials or methods.
3. Submittals as required for Substitutions.

C. Submit written notice to Architect, designating time Work will be uncovered, to provide observation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching of materials and surfaces shall be in accordance with the requirements of the Contract Documents. Where not otherwise defined, patching shall match adjacent surfaces and proper materials shall be provided accordingly.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of Work, including elements subject to movement or damage during cutting and patching.

B. After uncovering Work, inspect conditions affecting installation of new products.

3.02 PREPARATION PRIOR TO CUTTING

A. Provide shoring, bracing and support as required to maintain structural integrity of Project.

B. Provide protection for other portions of the Project, including all Contractors' personnel.

3.03 PERFORMANCE

A. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances, finishes.

B. Execute cutting and demolition by method which will prevent damage to other Work, and will provide surface to receive installation of repairs and new Work.

1. No cutting shall be performed which will, in any way, reduce the structural strength of the building. Should such cutting be necessary, consult Architect and do not proceed with such operation unless written approval is given.

C. Restore Work which has been cut or removed; install new products to provide completed Work in accord with requirements of Contract Documents.

D. Patching of materials and surfaces shall be in accordance with the requirements of the Contract Documents. Where not otherwise defined, patching shall match existing or adjacent surfaces and proper materials shall be provided accordingly.

1. Wherever existing walls, floors, ceilings, etc., are cut, the exposed surfaces

must be neatly finished by patching, painting, wall covering, etc., as required to blend patched areas into adjacent existing surfaces. Patched areas shall not be visible when viewing entire wall surface.

2. Where painting or finishing of patched surfaces or application of wall or floor covering is required, finish the entire plane of surface in which patched area occurs.

3.04 SLEEVES AND OPENINGS

A. Where pipes, conduits, ductwork or other materials pass through new walls, partitions, floors, roof or ceilings, provide suitable sleeves in these elements or provide openings where sleeves are not practical.

B. Close sleeves and openings to prevent passage of smoke or fire using approved methods and materials to maintain the fire rating of the construction being penetrated. See Section 07 84 00.

1. Unless otherwise indicated, extend floor sleeves 2" above finished floor.

C. Where pipes, conduit, ductwork etc., pass through, behind, or above existing construction, provide all cutting, patching, and refinishing for doing this work as specified herein.

D. Penetrations under beams or other concentrated loads require approval of Architect.

END OF SECTION

SECTION 01 74 00

CLEANING

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Execute cleaning, during progress of the work and at completion of the work (final cleaning), as required by Contract Documents.

1.02 WORK SPECIFIED IN OTHER SECTIONS

A. Cutting and Patching: Section 01 73 29.

B. Cleaning for Specific Products or Work: Specification section for the work.

1.03 CLEANING AND DISPOSAL REQUIREMENTS

A. Standards: Maintain project in accord with the following safety and insurance standards:

1. Applicable Federal and State Requirements.
2. National Fire Protection Association.

B. Hazards Control: Comply with the following requirements:

1. Store volatile wastes in covered metal containers, and remove from premises daily.
2. Prevent accumulation of wastes which create hazardous conditions.
3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on project site.
2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary sewers.
3. Do not dispose of waste into streams or waterways.
4. Wet down dry materials and rubbish to prevent dust.

D. Clean streets, highways, and private properties of all mud, earth, rubbish, rocks, refuse or other debris of any kind resulting from such work or related transportation to and from the work site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Select and use cleaning materials and equipment with care to avoid scratching, marring, defacing, staining or discoloring surfaces cleaned.

B. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

C. Use cleaning materials only on surfaces recommended by the cleaning material manufacturer.

PART 3 EXECUTION

3.01 DURING CONSTRUCTION

A. Provide, maintain and empty 55 gallon metal and dumpster type containers for collection of waste materials, debris and rubbish. Locate containers as directed by Architect.

1. Provide containers with adequate capacity to accommodate anticipated needs. If containers do not have adequate capacity, increase intervals of waste removal or capacity of containers until adequate capacity is provided.

B. At reasonable intervals during progress of Work, but in no case less than once a week, clean site and public properties and dispose of waste materials, debris and rubbish.

C. Direct Special Attention To:

1. Provide non-staining layout lines and other markings on masonry and concrete. Use chalk lines wherever possible and remove when no longer needed.
2. Remove all stains from concrete surfaces, including floors.
3. Shop marks shall not appear on exposed surfaces of any item.
4. Remove concrete, mortar and paint spatters.
5. Clean both brick and concrete unit masonry.
6. Protect aluminum frames during construction and thoroughly clean upon completion of the installation.

D. Clean interior surfaces before start of finish painting and continue cleaning on an as-needed basis until painting is finished.

E. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

G. Vacuum interior building areas where work is performed prior to painting and other

finish work. Continue vacuum cleaning on an as needed basis until building is ready for occupancy.

H. Protect interior of ductwork during construction from accumulation of dirt, dust or debris.

I. Clean trash from all chases and concealed spaces before final enclosure.

3.02 FINAL CLEANING

A. At the completion of the work, remove all surplus material, false work, temporary structures, including foundations thereof, plants of any description and debris of every nature resulting from their operations and put the site in a neat and orderly condition.

1. Exposed painted ductwork to be brushed clean of dust.

B. Remove temporary protection and labels not required to remain

C. Clean surfaces of equipment; remove excess lubrication.

D. Remove debris, rubbish, dirt, etc. from open concealed spaces, chases and above ceilings.

E. Repair, patch and touch-up marred surfaces to specified finish, to match adjacent surfaces.

F. Maintain cleaning until Final Completion.

G. Employ experienced workmen, or professional cleaners for final cleaning.

H. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

I. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight-exposed interior and exterior surfaces, including light fixtures and lenses; polish surfaces so designated to a shine finish.

1. Clean finishes free of dust, stains, films and other foreign substances.
2. Clean transparent and glossy materials to a polished condition; remove foreign substances. Polish reflective surfaces to a clear shine.
3. Vacuum clean carpeted and similar soft surfaces.
4. Clean resilient and floor finishes as specified.

J. Remove waste, foreign matter, and debris from roofs, gutters, areaways, and drainage systems.

K. Remove waste, debris, and surplus materials from site. Clean grounds; remove stains, spills, and foreign substances from paved areas and sweep clean. Rake clean other exterior surfaces.

L. Clean plumbing fixtures to a sanitary condition.

M. Clean permanent filters of ventilating equipment and replace disposable filters when units have been operated during construction; in addition, clean ducts, blowers, and coils when units have been operated without filters during construction.

N. Clean light fixtures and lamps; polish lenses.

O. Clean dirt and debris from interior of all electrical panels and user accessible electrical enclosure boxes prior to installation of covers or in the case of hinged access doors, before final cleaning of adjacent space. Clean the exterior surfaces of all switchgear located in Mechanical and Electrical Rooms and spaces.

P. Clean dirt and dust from interior of air handling units before installing final filters. Wipe down the exterior surfaces of all HVAC equipment located in Mechanical Rooms and spaces.

Q. Prior to Final Completion, or Owner occupancy, Contractor shall conduct an inspection of sight exposed interior and exterior surfaces, and all work areas, to verify that the entire work is clean.

END OF SECTION

SECTION 01 77 70
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 PRE-CLOSEOUT SUBMITTALS

A. Submit required tabulations when Work reaches seventy-five percent completion; however, regardless of percent completion, submit not later than 30 days prior to the scheduled date on which Substantial Completion is required.

B. Submit tabulations of:

1. Equipment and systems for which the specifications require demonstrations or training, indicating relevant specification sections, scheduled time and place for demonstration and training sessions, and intended audience. Adjust schedule if instructed by Designer to do so.

2. Equipment and systems for which operating and maintenance data are required in the Operating and Maintenance Data Binders and related documents are required in the Project Data Binders.

3. Spare parts and extra materials required, indicating the relevant specification sections, and the appropriate party to whom the items are to be delivered.

1.02 REQUEST FOR CLOSEOUT INSPECTION

A. SUBSTANTIAL COMPLETION:

When Contractor considers Work substantially complete, Contractor shall submit to Designer:

1. written assertion that Work is Substantially Complete;

2. a list of items to be completed or corrected and dates scheduled for completion or correction of each item;

3. certification that orientation and training for facility maintenance personnel is complete or written assertion that such orientation and training will be certified prior to inspection;

4. written assertion that Operating & Maintenance Data Binders are complete and available or will be prior to inspection;

5. written assertion that Use and Occupancy Permit(s) are complete and available or will be prior to inspection; and,

6. written assertion that an application for payment will be prepared commensurate with the degree of completion and submitted at the Substantial Completion inspection.

B. FINAL INSPECTION:

When Contractor considers Work complete, Contractor shall submit to Designer:

1. certification that a qualified person authorized by Contractor has reviewed the Contract Documents and inspected the Work;

2. written assertion that the Work is complete and in accordance with Contract Documents and ready for Final Inspection;

3. written assertion that additional materials necessary to augment the Operating & Maintenance Data Binders with instructions for adding these to the Binders, or full replacement Binders, are complete and available or will be prior to inspection;

4. written assertion that Project Data Binders and Construction Record Documents are complete and available or will be prior to inspection; and,

5. an application for final payment

C. Upon receipt of an appropriate request for inspection, Designer will schedule an inspection meeting with Contractor, and Owner's representatives to determine the status of completion.

1.03 RESULTS OF CLOSEOUT INSPECTIONS

A. Should the Designer determine that Work is not complete to the degree asserted by Contractor, Designer will promptly notify Contractor in writing stating the deficiencies. Contractor shall take immediate steps to remedy deficiencies and make a request for Re-Inspection.

B. SUBSTANTIAL COMPLETION: Designer will prepare a Certificate of Substantial Completion accompanied by a list of items to be completed or corrected, and will submit Certificate to Contractor and to Owner for signature with an accounting of Liquidated Damages due, when Designer verifies that:

1. Work is Substantially Complete based on an inspection conducted pursuant to an appropriate request for Closeout inspection;
2. orientation and training for facility maintenance personnel is complete; and,
3. Operating & Maintenance Data Binders are complete and have been delivered to the Owner.

C. FINAL INSPECTION: Designer will certify that the Work is Complete, and will initiate Final Adjustments, when Designer verifies that:

1. Work is complete in accordance with Contract Documents based on an inspection conducted pursuant to an appropriate request for Closeout inspection;
2. orientation and training for facility maintenance personnel is complete; and,
3. additional materials necessary to augment the Operating & Maintenance Data Binders with instructions for adding these to the Binders, or full replacement Binders, are complete and have been delivered to the Owner.
4. Project Data Binders and Construction Record Documents are complete and have been delivered to the Designer.

1.04 RE-INSPECTION FEES: If the Work fails a Closeout inspection, and a subsequent inspection is requested and conducted based on Contractor assertion of the same stage of completion, Owner will compensate Designer for performing such Re-Inspection as additional services, and deduct the amount of such compensation from the Contract Sum by appropriate modification.

1.05 FINAL ADJUSTMENTS

A. When Designer has certified that the Work is complete, Designer will determine whether modification is needed to reflect appropriate adjustments to Contract Sum which were not previously effected. If such modification is needed, Designer shall assist the Owner in its preparation and deliver it to Contractor, who in the case of a change order, shall sign and return it to Designer.

B. When Designer has certified that the Work and needed modifications to the Contract are complete, and if necessary, Designer will instruct Contractor to submit a revised final application for payment.

1.06 ONE-YEAR CORRECTIVE INSPECTION

A. An inspection will be scheduled and conducted at project site prior to one year from date Substantial Completion was achieved, but as close to the end of that year as is reasonably possible.

B. The inspection will be attended by at least one representative each of Owner, Designer, and Contractor.

C. The inspection will confirm non-conforming items previously identified for correction by the Owner, and whether corrections have been completed or are still outstanding, and is intended to be an opportunity for Contractor to become aware of any outstanding corrections needed.

END OF SECTION

SECTION 01 78 21
CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.01 DATA BINDERS

A. Provide two complete sets in durable, commercial quality, plastic covered, three ring binders. Identify project and type of data on face and side.

B. Provide information required by Contract Documents, including:

1. Cover sheet giving complete project title and number, Contractor's name, address, phone number, superintendent's name, and related information.

2. Table of Contents identifying material in Binder, and identifying missing materials to be added later or certifying completeness of Binder.

C. OPERATING & MAINTENANCE DATA BINDERS

1. Provide Product Data, including: manufacturer; model number; names, addresses, and telephone numbers of suppliers, installers, and servicers; related information for repair, renovation, or additions.

2. Provide Operating and Maintenance Data, including: instructions and schedules for proper operation, maintenance, servicing, and lubrication with manufacturer's parts list, illustrations, assembly drawings, maintenance diagrams, and list of recommended lubricants and cleaning agents; as-installed control diagrams and coordination drawings with color coded piping and wiring diagrams; valve tag charts with numbers, locations, and functions; panel board circuit directories; and, list of materials and parts furnished for Owner. Review brochures and manufacturer's standard printed information for data pertaining to models other than those actually provided, and mark to clearly omit inapplicable information and identify units actually installed.

D. PROJECT DATA BINDERS

1. On the form exhibited as Section 01 78 88, provide a complete list of subcontractors and material suppliers, including dollar amount, company name, address, phone number, local representative, and information regarding minority-owned business status.

2. Provide Certificate of Substantial Completion, Use and Occupancy Permits, and Certificate(s) of Inspection or letter(s) of acceptance from governing authorities as apply.

3. Provide Contractor's warranty of the work.

4. Provide guarantees, warranties, bonds, certifications, maintenance agreements, service contracts, and related documents, including beginning date, duration, information about instances which might affect validity, and proper procedure in case of failure.

1.02 CONSTRUCTION RECORD DOCUMENTS: Keep the record copy of Contract Documents required by paragraph 3.11 of the Conditions in good condition and in the course of the Work, legibly mark these to record actual conditions of Work, including: location, depth, and identification of new and existing underground items, utilities, valves, tap points, equipment, service access, test points, and related features; field changes in dimensions and detail; changes by addenda or Modification; and, description and details of features for maintenance, service, replacement, or expansion of the Work.

END OF SECTION

SECTION 01 78 25
DATA BINDER RECEIPT

PART 1 - GENERAL

1.01 RELATED SECTIONS

Section 01 29 76 Payment Procedures
Section 01 77 70 Close-Out Procedures
Section 01 78 21 Close-Out Submittals

1.02 CONTRACTOR PREPARATION AND USE OF THIS FORM

A. Use this form or a reasonable facsimile to verify delivery of Data Binders. Fill in the identifying information following this paragraph, then use the prepared form as a receipt, for signature by the person to whom Data Binders are delivered. Provide a copy of the receipt with the application for payment.

1. For the Application for Payment commensurate with Substantial Completion, provide a copy indicating delivery of Operating and Maintenance Data Binders.

2. For the Application for Payment commensurate with Final Completion, provide a copy indicating delivery of Project Data Binders.

B. Identifying Information:

1. For the Work:

Project Title, including SBC project number, institutional location, and work name:	

2. For the Data Binder:

Cross out that which does not apply.	Operating & Maintenance Data Binder Project Data Binder

1.03 RECIPIENT SIGNATURE

A. By signature below, recipient acknowledges receipt of the Data Binder identified above, but does not certify the completeness or correctness of the Data Binder.

Recipient Signature:	
Please legibly indicate recipient's name and title or affiliation with Owner:	

END OF SECTION

SECTION 01 78 88
REPORT OF SUBCONTRACTORS AND SUPPLIERS

Project	SBC Project Number	Page
		of

Use first entry on first page for General Contractor

Work performed or Material Supplied, and Dollar Value	Firm name and address	Principal Contact and Phone	If a Minority-Owned Business, classification and certifying agency. If not, "NO".

SECTION 01 79 21
DEMONSTRATION and TRAINING

PART 1 - GENERAL: not used

PART 2 - PRODUCTS: not used

PART 3 - EXECUTION

3.01 Equipment Start-up / Commissioning

A. Conduct demonstration and instruction as soon as practicable upon installations, and prior to Substantial Completion inspection. Substantial Completion shall not be certified, nor shall Owner be required to assume responsibility for operating, maintaining, or insuring system, prior to complete demonstration and instruction.

B. Demonstrate operation of newly provided equipment and systems to Designer and to Owner's representative. Instruct Owner's personnel in operation, adjustment, and maintenance of equipment and systems, using the operating and maintenance data as the basis of instruction.

C. Make lists of persons witnessing equipment and systems demonstration, and persons receiving operating instruction, using a format similar to the form included in Section 01 79 25 with project, subject, trainer, session information, and attendees identified. Include copy of lists in the Operating and Maintenance Data Binders.

END OF SECTION

SECTION 01 79 25
DEMONSTRATION AND TRAINING VERIFICATION

PART 1 – GENERAL

1.01 Use a copy of this page as a planning form for demonstrations and training. Fill in the basic identifying information below:

SBC Project Number: _____

Institution/Location: _____

Project Name: _____

Required date of Substantial Completion

Owner's Facility Coordinator: _____ Phone: _____

Owner's Maintenance Contact: _____ Phone: _____

Contractor Contact: _____ Phone: _____

1.02 If a list of required demonstrations and training has been specified in Division 1, use that list as a starting point, review the project manual for other specifications that require training of the Owner's operators, and complete the list below. Check the box on left if Demonstration and Training is required on the standard listed subjects; add subjects as identified by review of the specifications and check the box to the left of each; and, schedule and indicate an target date for each. If the number of training subjects exceeds the available space provided here, replace or continue the list on a similarly formatted separate page. Submit the list with the initial Progress Schedule, and update as necessary during the Work to ensure that advance notice of the demonstration and training schedule is acceptable to the Designer.

	Spec Reference	Subject	Target Date	Actual Date
		Accessibility		
		Boiler		
		Chiller		
		Controls		
		Data Transmission		
		Electrical		
		Elevator / Conveying		
		Fire Alarm		
		Irrigation		
		Mechanical		
		Plumbing		
		Telecommunications		

PART 2 – PRODUCTS: not used.

PART 3 – EXECUTION

3.01 For each session conducted, use this page as a **Training Verification Report**.

A. Fill in the information below prior to the session ("End Time" may be filled in after):

SBC Project Number: _____

Institution/Location: _____

Project Name: _____

Subject Equipment / System:	
Spec Reference	

Demonstration and Training (by whom, where, when)	Trainer Name:	Company:		Phone:
	Place:	Date:	Start Time:	End Time:

B. Minimum Agenda Requirements:

☐ System Walk-through ☐ Operation ☐ Trouble-shooting ☐ Maintenance ☐ Safety

C. Attendance: Each person receiving the demonstration and training shall sign in below, or on a similarly formatted continuation page:

Initials	Legibly print your name	Unit and title or function

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide rough carpentry work as shown and specified. Work includes:

1. Roof curb openings blocking and nailers.
2. Concealed blocking for support of accessories, equipment, specialty items, cabinets, fixtures, trim and facing materials. Provide where necessary whether indicated or not.
3. Plywood sheathing.
4. Preservative treatment.
5. Rough hardware and accessory materials.

1.02 RELATED SECTIONS

A. Exterior Sheathing Board: Section 09 21 16.

1.03 REFERENCES

A. Standards

1. American Plywood Association (APA): Grades and Standards
   a. APA Plywood Design Specification, Form No. Y510T.
   b. APA Engineered Wood Construction Guide, Form No. E30R.
2. American Wood Preservers Association (AWPA): Treatment Standards.
   a. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties Pressure Treatment.
   b. AWPA C9 - Plywood Pressure Treatment.
3. PS - U.S. Product Standard: Softwood Lumber and Plywood Standards
   a. PS-1 - Construction and Industrial Plywood.
   b. PS-20 - American Softwood Lumber Standard.

1.04 SUBMITTALS

A. Shop Drawings: Submit shop drawings indicating framing connection details, fastener connections and dimensions.

B. Preservative Treated Wood: Submit certification by treating plant stating chemical and process used and conformance with applicable standards.

1.05 QUALITY ASSURANCE

A. Softwood Lumber: Grading rules and wood species shall conform with the

voluntary Product Standards PS 20 including grading rules of the following associations, as applicable:

1. Southern Pine: Standard Grading Rules for Southern Pine Lumber, published by Southern Pine Inspection Bureau (SPIB).
2. Douglas Fir, Western Larch and Hemlock: Western Lumber Grading Rules, published by Western Wood Products Association (WWPA), or Standard Grading and Dressing Rules for West Coast Lumber Inspection Bureau (WCLIB).
3. Western Spruce, Pine and Fir: Western Spruce-Pine-Fir Association (WSPFA) and current Canadian Grading Rules by National Grades Association, Canada.

B. Softwood Plywood: Grading rules and wood species shall conform with Product Standard PS 1.

C. Grade Marks

1. General: Identify all lumber and plywood by official grade mark.
2. Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping, or combination designation, rules under which graded, where applicable and condition of seasoning at time of manufacture.
3. Softwood Plywood: Appropriate grade trademark of the American Plywood Association.
   a. Type, grade, class and identification index.
   b. Inspection and testing agency mark.

1.06 STORAGE AND HANDLING

A. Store off the ground.

B. Protect from direct contact with the weather.

C. Provide proper ventilation.

D. Adhesives

1. Do not store adhesives with materials that have a high capacity to absorb VOC emissions (i.e., materials which are woven, fibrous or porous in nature, such as acoustical ceilings, carpets, textiles, etc.).
2. Do not store adhesives in occupied spaces.

1.07 JOB CONDITIONS

A. Time delivery and installation of carpentry work to avoid delaying trades whose work is dependent on, or affected by, the carpentry work and to comply with protection and storage requirements.

B. Installer must examine the surfaces and supporting structure and the conditions

under which the carpentry work is to be installed, and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

C. Correlate location of furring, nailers, blocking, grounds and similar supports so that attached work will comply with design requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Dimension Lumber - General

1. Nominal sizes are indicated, except as shown by detailed dimensions. Provide lumber complying with lumber producer's inspection agency grading rules certified as conforming to the "National Grading Rule for Dimension Lumber," by Board of Review of the American Lumber Standards Committee (ALCS), established under Section 10 of PS 20.
2. Dress dimension lumber S4S unless otherwise shown or scheduled.
3. Provide seasoned dimension lumber with 19% maximum moisture content at time of dressing and complying with the dry size requirements of PS 20. Mark lumber "S-DRY".

B. Light Framing Lumber: Where framing lumber from 2" through 4" thick, and 4" or less wide is indicated, provide lumber complying with the specified requirements for dimension lumber and with the following grading, unless otherwise indicated:

1. Provide "Construction" grade light framing and mark "CONST".
2. Where stud framing is shown, provide "Stud" grade lumber and mark "STUD".
3. Specie: Any commercial softwood.

C. Miscellaneous Lumber

1. Provide wood for support or attachment of other work such as cant strips, nailers, blocking, furring, grounds, bucks, stripping and similar members. Provide lumber of the sizes shown or specified, worked to shapes shown and as follows:
   a. Specie: Any commercial softwood, construction grade.

E. Plywood: Provide exterior grade plywood for exterior use and interior type with exterior glue for interior use.

1. Concealed Use
   a. Exterior: APA-CD-EXT.
   b. Interior: APA-CD-EXPOSURE I, with exterior glue.
2. Exposed Interior Use - Painted Finish: APA MEDIUM DENSITY OVERLAY (MDO).

3. Backing Panels: APA CD PLUGGED INT with exterior glue, square edge.

2.02 PRESERVATIVE WOOD TREATMENT

A. Pressure treat all wood lumber members in contact with masonry or concrete with water-borne preservatives in accordance with AWPA C2 for lumber to comply with AWPA Standard T-1 and U-1.

1. Provide ACQ or CBA-A; CHEMICAL SPECIALTIES, INC. Preserve; OSMOSE NatureWood; WOLMANIZED Natural Select.
2. Retention
   a. ACQ: Minimum 0.25 lbs./cu. ft.
   b. CBA-A: Minimum: 0.20 lbs./cu. ft.

B. Mark each piece of treated lumber with AWPA Quality Mark designation denoting conformance to the appropriate specification.

C. After treatment, kiln-dry lumber and plywood to maximum 19% moisture content. Inspect each piece of lumber after drying and discard damaged or defective pieces.

D. Complete fabrication of treated items before treatment, where possible. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment.

2.03 ROUGH HARDWARE

A. General: Provide all necessary spikes, screws, nails, bolts and other hardware for satisfactory erection of work. Except where noted to be stainless steel, provide hot-dipped galvanized finish for hardware exposed to exterior, located in toilet rooms, in contact with treated wood or in contact with roofing or flashing.

1. Nails: Common wire nails, except where noted otherwise on drawings; sizes as noted or specified herein.
2. Attachment to Concrete or Masonry: Metal expansion type shields or inserts; sizes as required to accommodate applied fastener; spacing as indicated on drawings.
   a. "DH" or "Ankr-Tight" by WEJ-IT or equal by RED HEAD or HILTI.
   b. Sleeve type for masonry.
   c. Wedge type for concrete.
3. Attachment to Steel Studs: Self tapping screws of sufficient length and strength to perform the functions for which they are used.
4. Roof Construction
   a. Wood-to-Wood Attachment: 300 Series stainless steel, flat head.
      1) Plywood to Nailers: Minimum #8 x 1-3/4".
   b. Wood-to-Metal Deck Attachment: Hot dip galvanized in accordance with ASTM A153; machine bolts, locknuts and washers; minimum 3/8" diameter.

B. Provide plates, anchors, hangers and other miscellaneous steel and iron shapes as required for framing and supporting woodwork and for anchoring or securing

woodwork to concrete or wood structures.

2.05 MISCELLANEOUS ITEMS

A. Adhesive - For field gluing panels to framing or to other wood panels: Low-VOC, FS MMM-A-125C, Type II, water- and mold-resistant. Use ASTM D3110, dry-use type for laminated and finger-jointed members, certified in accordance with ASTM C557 and complying with required VOC regulations.

PART 3 EXECUTION

3.01 INSTALLATION

A. General

1. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate the work with a minimum of joints or the optimum jointing arrangement.
2. Fit carpentry work to other work. Scribe and cope as required for accurate fit.
3. Set wood framing accurately to required lines and levels.
4. Cut, join and tightly fit framing around other work.
5. Anchor and nail as indicated, or if not indicated to comply with the Authorities having jurisdiction (local Codes).
6. Fasteners
   a. Use common wire nails, except as otherwise shown or specified herein.
   b. Use finishing nails for exposed work.
   c. Do not wax or lubricate fasteners that depend on friction for holding power.
   d. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials.
   e. Make tight connections between members.
   f. Install fasteners without splitting of wood; predrill as required. Do not drive threaded friction type fasteners; turn into place.
   g. Tighten bolts and lag screws at installation and retighten as required for tight connections prior to closing in or at completion of work.
   h. Countersink nail heads on exposed carpentry work and fill holes.
   i. Provide washers under bolt heads and nuts in contact with wood.
7. Nail plywood to comply with the recommendations of the American Plywood Association.

B. Wood Grounds, Nailers and Blocking

1. Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached or screeded.
2. Coordinate location with other work; refer to shop drawings of such work, if any.

3. Attach to surfaces securely with anchor bolts or other attachment devices as shown, and as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry as work progresses, cutting to fit masonry unit size involved. Anchor to formwork before concrete placement.
4. Provide grounds of dressed, key-bevelled lumber not less than 1-1/2" wide and of the thickness required to bring face of ground to exact thickness of finish material involved.
   Remove temporary grounds when no longer required. Where indicated as permanent grounds, provide treated lumber.
5. Anchor plates, blocking, nailers, etc. to masonry and concrete masonry units (units with cores grouted solid) with minimum 1/2" diameter fasteners spaced at 4' o.c., unless otherwise indicated. Situations requiring special bolting shall be with size and spacing of bolts as required.

3.02 MISCELLANEOUS INSTALLATIONS

A. Backing Panels: Provide plywood backing panels for electrical and telephone equipment where indicated.

1. Provide fire-retardant material at interior locations.
2. Provide preservative treated material at exterior locations.

3.03 WOOD TREATMENT

A. Preservative Treated Wood Products: Provide pressure treatment for all lumber and plywood as specified hereinbefore.

B. Field Cuts: Apply 2 brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.

3.04 CLEANING

A. Clean up debris and cuttings daily. Remove and dispose of excess materials and debris created by carpentry.

B. Maintain the building and site free of accumulations of cutting and waste materials in a neat orderly condition acceptable to the Architect.

3.05 WASTE MANAGEMENT

A. Do not burn scraps of treated wood. Do not mix treated wood scraps with untreated wood. Hazardous wastes shall be separated, stored, and disposed of according to local regulations.

END OF SECTION

SECTION 06 61 17

SOLID SURFACE COUNTERTOPS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work includes solid surfacing countertops with integral sink bowls and splashes as indicated on the drawings.

1.02 RELATED SECTIONS

A. Rough Carpentry: Section 06 10 00.

1.03 SUBMITTALS

A. Submit shop drawings for countertops.

1. Provide large scale details.
2. Indicate methods of fabrication, edging, location and construction of joints.

B. AWI Quality Standards: A photo-copy of the applicable portions of the AWI publication "Architectural Woodwork Quality Standards", latest edition, shall be submitted with each set of shop drawings.

1. Each copy must be marked to clearly show all details, specifications and finishes proposed for this work.

C. Submit samples of the solid surface counter top.

D. Manufacturer's product data describing solid surface counter top material.

1.04 QUALITY ASSURANCE

A. Fabricator qualifications: A firm specializing in the fabrication of solid surface items with a minimum of 5 years experience and a satisfactory record of performance on projects of comparable size and quality. Fabricator shall be acceptable to the Architect.

B. Installation: Performed only by skilled finish carpenters with a minimum of 3 years experience in installing custom solid surface items similar to that required for this project.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect materials and items during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver materials and items until concrete, masonry, painting, grinding and other similar wet work has been completed and is thoroughly dry.

C. Store materials in dry, well-ventilated spaces with constant minimum temperature of 60 degrees F., and maximum relative humidity of 55%.

1.06 PROJECT CONDITIONS

A. Provide and maintain a constant temperature and humidity before, during and after installation as required to maintain optimum moisture content of installed materials.

B. Obtain measurements and verify dimensions and details before proceeding with architectural woodwork.

PART 2 PRODUCTS

2.01 BASIC MATERIALS AND FABRICATION METHODS

A. Solid Surface Material

1. Material: Homogeneous filled acrylic meeting ANSI Z124.3 and .6, Type Six, and Fed. Spec. WW-P-541E/GEN.
2. Basic Minimum Material Properties
   a. Hardness: 52-60 Barcol ASTM D785.
   b. Specific Gravity: 1.53-11.8 g/cc ASTM D972A
   c. Tensile Strength: 4000 ASTM D638.
   d. Flexural Strength: 7000 ASTM D790.
   e. Izod Impact: .24 ASTM D256.
   f. Thermal Expansion: .000018-.0000042 in./in./^{o}C ASTM D696.
3. Thickness: ¾".
4. Colors: As selected by Architect.

B. Manufacturer

1. Basis of Design: Drawings and specifications are based on products fabricated from Corian by DuPONT, Staron by SAMSUNG/CHEIL INDUSTRIES or equal.
2. Other Manufacturers: Products by other manufacturers will be considered during bidding. Products must meet the performance requirements specified, match colors selected as determined by the Architect, conform to details indicated on the drawings and be approved by Architect.

B. Fabrication

1. Fabricate to dimensions, profiles and details indicated with openings and mortises precut, where possible to receive fixtures, accessories and other similar items of work.
2. Ease edges as indicated on the drawings. Fabricate edges with solid surface material, except as otherwise indicated.

3. Complete fabrication and other work before shipment to site to the greatest extent practicable. Disassemble components where necessary for fitting at site. Provide ample allowance for scribing, trimming and fitting.
4. Secure bowls and splashes or similar items to countertop per manufacturer's installation method; seamed undermount "S".

C. Measurements: Prior to fabrication of items required to be fitted to other construction, obtain field measurements and verify dimensions and Shop Drawing details as required for accurate fit.

2.02 MISCELLANEOUS MATERIALS

A. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, nonporous joints, with chemical bond.

B. Screws: Select material, type, size and finish required for each use. Comply with FS FF-S-111.

PART 3 EXECUTION

3.01 PREPARATION

A. Condition materials, items and products to average prevailing humidity conditions in installation areas before installing.

B. Install blocking and anchoring devices built into substrates for anchorage of solid surface fabrications.

C. Deliver inserts and anchoring devices to be built into substrates well in advance of time substrates are to be built.

3.02 INSTALLATION

A. General

1. Install items plumb, level, true and straight with no distortion.
2. Shim as required using concealed shims.
3. Install to a tolerance of 1/8" in 8'-0" for plumb and level, with no offset in flushness of adjoining surfaces.

B. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

C. Install countertops level, true to alignment, accurately fit to wall conditions and securely fastened to base units and other support systems as indicated.

3.03 CLEANING AND PROTECTION

A. Repair damaged and defective items to eliminate functional and visual defects.

Where not possible to repair properly, replace items as directed by the Architect.

B. Protect installed work during remaining construction operations.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide metal doors and frames as indicated and specified. Work includes, but is not limited to:

1. Standard steel doors and frames.
2. Fire rated steel doors and frames.

1.02 RELATED SECTIONS

A. Hardware: Section 08 71 10.

B. Wood Doors: Section 08 14 00

1.03 QUALITY ASSURANCE

A. Provide metal doors and frames fabricated by one manufacturer to ensure uniformity in appearance and construction.

B. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

1. ANSI: American National Standards Institute.
2. ASTM: American Society for Testing and Materials.
3. SDI: Steel Door Institute.
4. DHI: Door and Hardware Institute.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of standard metal door and frame required.

B. Submit shop drawings. Identify doors and frames in accordance with drawing door schedule. Indicate:

1. Elevations of each door design.
2. Hardware locations, installation methods and hardware reinforcements.
3. Dimensions and shapes of materials, anchorage and fastening methods.
4. Door frame types, profile of molding and details.
5. Wall opening construction and connection to other work.

C. Product Data. Provide single source supplier for the Work of this Section.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver metal doors and frames cartoned or crated for protection during transit and job delivery. Provide sealed wrapping for factory.

B. Store doors and frames inside the building in a dry, well-ventilated area. Protect from damage, wetting and deterioration in accordance with manufacturer's recommendations.

1.06 LABEL DOOR REQUIREMENTS

A. Comply with the label requirements of NFPA and applicable local codes. Fabricate doors and frames in accordance with requirements of NFPA Standard No. 80 and UL Standard for Safety No. 10B for the class of door opening shown or scheduled.

1. Provide UL labels permanently fastened on each door and frame which is within the size limitations established by NFPA and UL for labeling.
2. Provide anchors for UL labeled frames required by the authority having jurisdiction.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: STEELCRAFT MFG. CO; AMWELD BUILDING PRODUCTS DIV.; CECO CORP.; PIONEER INDUSTRIES; REPUBLIC BUILDERS PRODUCTS CORP.; FENESTRA; CURRIES.

2.02 MATERIALS AND COMPONENTS

A. Standard metal doors and frames: Comply with SDI 100 material and fabrication recommendations and as specified.

B. Standard Metal Doors

1. Provide flush seamless type doors with seamless faces and edges, 1-3/4" thick, internally reinforced. Top and bottom closed flush.
   a. Provide glass lites where indicated.
2. Exterior Doors: Provide Grade III (extra heavy duty), Model 2 (seamless design). Fabricated from ASTM A526, 16 gage, commercial quality stretcher level, galvanized steel face sheets with ASTM A525 G60 or A60 zinc coating, mill phosphatized, 1-1/2 lb. density polyurethane insulated core U-factor 0.09, tops and bottoms closed with flush galvanized steel caps.
3. Interior Doors: Provide Grade II (heavy duty), Model 2 (seamless design). Fabricated from ASTM A366, 18 gage, commercial quality, stretcher level, cold-rolled steel face sheets with a Kraft resin impregnated honeycomb or polystyrene slab core bonded to door face sheets with thermal adhesive.
4. Hardware Reinforcements: Meet or exceed SDI 107 requirements.

5. Edge Profile: 1/8" bevel in 2" core on hinge and lock edges.
6. Astragals for pairs of doors: Manufacturer's standard for labeled and non-labeled openings. Factory prepare for hardware as scheduled in Section 08 71 10. Mount astragal to overlap on key side of doors.

C. Standard Metal Frames

1. Interior Frames: Fabricated from ASTM A366, commercial quality cold rolled steel, 16 gage. Set-up and welded type, all miters clean cut, reinforced, fully seam welded with exposed welds ground smooth.
2. Exterior Frames: Fabricated from ASTM A526, 16 gage commercial quality galvanized steel with ASTM A525 G60 or A60 zinc coating, mill phosphatized. Set-up and welded type, all miters clean cut, reinforced, fully seam welded with exposed welds ground smooth.
3. Profile: Double rabbet, jamb face and depth as indicated.
4. Hardware Reinforcements: Meet SDI 107 requirements.
5. Transoms and Sidelites: Provide for loose glazing stops to be secured with countersunk screws.
    a. Provide ¾" stops for sidelites and transoms where the individual glass areas for fire rated openings exceeds the allowable area for 5/8" stops.

D. Fire Doors and Frames

1. Comply with Label Door Requirements specified herein before.
2. Agency: Underwriter's Laboratories.
3. Classification: As indicated.
4. Conform to requirements of Standard Metal Door and Frames specified herein.

E. Frames for Glazed Openings (Borrowed Light): Minimum 18 gage with integral stop, profile and size per drawings. Provide loose metal glazing stops of same gage as frame.

1. Provide for loose stops to be secured with countersunk screws.

    a. Provide ¾" stops for sidelites and transoms where the individual glass areas for fire rated openings exceeds the allowable area for 5/8" stops.
2. Verify thickness of glazing material before fabrication and glazing clearances required.
3. Frame components to be fully welded, except required loose glazing stops, at connections with exposed welds ground flush and smooth with frame surfaces.
4. Fire Rated Frames: Provide for ratings indicated in accordance with paragraph 2.02D herein.

2.03 FABRICATION

A. Reinforce and prepare doors and frames to receive hardware. Fit for hardware at

the factory to template. Do all necessary cutting, drilling and tapping. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.

B. Provide surfaces smooth and free from defects, warp or buckle with arrises straight and sharp.

C. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for surface applied finish hardware may be done at project site.

D. Locate finish hardware as shown on final shop drawings or, if not shown, in accordance with DHI "Recommended Locations for Builder's Hardware."

E. Door and Frame Fabrication

1. Provide cutouts for mortised hardware, accurately located and made to fit hardware.
2. Punch frames for door silencers, three on strike side for single doors. Factory install plastic caps. Stick-on silencers are not acceptable.
3. Exterior and Interior Frames: Provide minimum three anchors of suitable design for each jamb. Provide galvanized anchors for units built into exterior walls.
4. Floor Anchors: Provide floor clip on bottom of each jamb. Provide angle spreaders at bottom of each set-up frame.
5. Conduit for Door Frames
   a. Shop install ¾" electrical conduit within hollow metal door frame where indicated or where required for electric strikes or similar type electrical frame mounted hardware.
   b. Route conduit in frame in the most direct and simple manner so that pulling wire can be performed with a minimum of bends and obstructions. Route conduit to avoid damage to conduit during field installation of frame and operations to grout frame solid.
   c. Connect conduit to electrical junction box or conduit embedded in building structure by means of a threaded coupling. The termination point of the conduit within the frame shall be free and have enough slack to make final connection to embedded device.

F. Shop Painting

1. Clean, bonderize or chemically treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
2. Clean steel surfaces of mill scale, rust oil, grease, dirt and other foreign materials before application of paint. Sand free of imperfections.
3. Apply one baked-on shop coat of rust-inhibitive prime paint in accordance with ASNI A224.1. Provide a smooth, uniformly finished surface ready to receive finish paint.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, rough openings and installation conditions. Do not proceed with metal door and frame work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Before installation, apply one coat of bituminous protective paint over shop primer to all concealed frame surfaces built into exterior openings.

3.03 INSTALLATION

A. Install metal doors and frames in accordance with manufacturer's installation instructions and final shop drawings.

B. Placing Frames

1. General
   a. Comply with ANSI A250.11 (Revision of SDI 105) "Recommended Erection Instructions for Steel Frames."
   b. Erect frames in proper position to receive partition work before construction of enclosing walls. Set frames accurately in position, plumbed, aligned with heads level and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders.
   c. Grout frames as indicated on the drawings. Coordinate grout placement with adjoining materials and door hardware.
2. At Masonry Construction: Locate wall anchors at 16" on center. Building-in of anchors and grouting of frames is specified in Section 04 00 00.
3. Fire-Rated Frames: In accordance with NFPA standard No. 80.
4. Metal Stud Partitions: Install at least 3 wall anchors per jamb at hinge and strike levels. Attach wall anchors to studs with tapping screws.

C. Door Installation

1. Install doors plumb and in true alignment in prepared openings. Fit metal doors accurately in frames, within clearances specified in ANSI/SDI A250.8 (SDI100).
2. Install fire-rated doors with clearances as specified in NFPA Standard No. 80.

D. Immediately after erection, sand smooth rusted or damaged areas of door and frame coat and apply touch-up prime coat of compatible air-drying primer.

3.04 FIELD QUALITY CONTROL

A. Final Adjustment: Provide final adjustment as follows:

1. Door Contact with Silencers: Doors shall strike a minimum of two (2) silencers without binding lock or latch bolts in strike plate.
2. Head, Strike and Hinge Jamb Clearance: 1/8".
3. Meeting Edge Clearance, Pairs of Doors: +1/16"
4. Bolts and Screws: Leave tight and firmly seated.

END OF SECTION

SECTION 08 14 00

WOOD DOORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide the following types of wood doors:

1. Solid core
2. Fire rated

1.02 RELATED SECTIONS

A. Installation: Section 06 20 00.

B. Hollow Metal Door Frames: Section 08 11 13.

C. Door Hardware Section 08 71 00.

1.03 QUALITY ASSURANCE

A. Provide wood doors fabricated by one manufacturer to ensure uniformity in appearance and construction.

B. Reference Standards

1. Underwriters' Laboratories - UL 10B (neutral pressure) and UL 10C (positive pressure) - Fire Tests of Door Assemblies
2. Window and Door Manufacturers Association (WDMA): WDMA IS 1A-04.
3. Architectural Wood Work Institute: AWI "Quality Standards, Guide Specification" requirements.
4. NFPA 80 - Fire Doors and Windows
5. NFPA 252 - Standard Methods of Fire Tests for Door Assemblies

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of wood door required.

1. Include details of core and edge construction.
2. Include certification indicating compliance with specification requirements.

B. Submit Shop Drawings

1. Indicate location and size of each door, elevation of each kind of door,

details of construction, location and extent of hardware blocking and other pertinent data.

2. Identify doors in accordance with drawing door schedule.

C. Submit sample corner section, 12" square, showing required veneer and edge construction.

D. Finish Samples

1. Factory Finished Doors: Submit three (3) flitch samples of each species of face veneer with factory applied stain and finish as specified and indicated illustrating expected range of color and grain variation.

2 Field Finished Doors: Submit three (3) flitch samples of each species of face veneer as specified and indicated illustrating expected range of grain variation. Samples will be used to select and approve field stain color as specified in Section 09 91 00.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store and protect doors in accordance with manufacturer's recommendations and WDMA.

B. Following are general guidelines. For more specific information refer to WDMA's Appendix Section “Care and Installation at Job Site.”

1. Deliver doors in manufacturer's original unopened protective packaging or wrapper.
   a. Store doors flat and off the floor on a level surface in a dry, well-ventilated building. Do not store on edge. Protect doors from dirt, water and abuse.
   b. Do not subject interior doors to extremes in either heat or humidity. HVAC systems should be operational and balanced, providing a temperature range of 50 to 90 degrees Fahrenheit and 30% to 50% relative humidity.
   c. When handling doors, always lift and carry. Do not drag across other doors or surfaces. Handle with clean hands or gloves.
   d. Each door will be marked on top rail with opening number.

1.06 LABEL DOOR REQUIREMENTS

A. Fire Ratings Compliance: Comply with the label requirements of NFPA and applicable local codes. Fabricate doors and frames in accordance with requirements of NFPA Standard No. 80 and U.L. Standards as follows:

1. Neutral Pressure Testing - UBC 43-2 or 7-2-94; or UL10B.
2. Positive Pressure Testing UBC 7-2-97 or UL10C

B. Ratings Certifications

1. Provide U.L. labels permanently fastened on each door that is within the

size limitations established by NFPA and U.L. for labeling.

2. Provide anchors for U.L. labeled frames required by the authority having jurisdiction.

1.07 WARRANTY

A. Submit written warranty on door manufacturer's standard form, signed by manufacturer, installer and Contractor, agreeing to repair or replace defective doors which have been warped (bowed, cup or twist), or which show telegraphing of core construction below face veneer, or delamination, or do not conform to tolerance limitations of WDMA I.S.1A-04 or other defects in materials and workmanship for the life of the installation for interior doors.

B. Warranty shall also include furnishing, installing and finishing new doors meeting specification requirements that may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Interior Flush Doors Solid Core: Meet or exceed WDMA I.S.1A Industry Standard for Wood Flush Doors requirements and as specified.

1. Interior Flush Doors Solid Core – Non-Rated and 20 Minute Rated Fire Doors: Provide one of the following cores with hardwood veneers:
   a. Particleboard Core (PC-5) to comply with ANSI Standard A208.1 LD-2, with screw holding power of 125 lbs., modulus of rupture of 800 psi, modulus of elasticity of 150,000 psi and density of 30-35 lbs. per cubic foot. Formaldehyde free.
   b. Stave Lumber Core (SLC-5) may be a combination of solid, low-density hardwood lumber blocks or strips not more than 2-1/2" wide of one species of wood between 6% to 9% moisture content. Joints to be tight and staggered in adjacent rows. Lumber density is 25 to 27 lbs. per cubic foot. Formaldehyde free.
   c. Structural Composite Lumber Core (SCLC-5) is an engineered hardwood composite sometimes referred to as LSL (Laminated Strand Lumber). The material complies with WDMA minimum performance levels for interior applications with screw holding power of 540 lbs., modulus of rupture of 6,500 psi, modulus of elasticity of 1,300,000 psi and density of 38 lbs per cubic foot. Formaldehyde free.
2. Interior Flush Fire Doors – Above 20 Minute Rated: FD solid core with hardwood face veneer.
   a. Rating as indicated on drawings.
   b. Provide one of the above cores or the following as required to maintain fire rating:
      1) Non-combustible mineral composite material that is necessary for higher hourly ratings per manufacturer’s approval.

B. Moldings: Trim louver and glass openings with recessed bead type wood moldings, species matching door face veneer species. Profile as selected by the Architect from manufacturer's standard profiles.

2.02 FABRICATION

A. Flush Doors: Fabricate doors in accordance with WDMA "Premium Grade" requirements for transparent stained finish. Formaldehyde free.

1. Core Construction: Bond stiles and rails to core and sand entire unit prior to assembly of face veneers.
2. Number of Plies: 5.
3. Face Veneers: Minimum 1/50" thick before sanding, plain sliced, Grade A red oak hardwood.
4. Door Thickness: 1-3/4" thick.
5. Adhesive: Type I, waterproof.
6. Edge Strips: Stile edges hardwood species matching face veneer; bonded to core; 1-1/8" minimum width after trimming. Top and bottom edges hardwood of mill option.
7. Veneer Matching: Provide veneers book matched for color and grain.
8. Hardware: Factory machine for mortise hardware using template provided by hardware manufacturer.
9. Reinforcement: Reinforce doors to receive hardware specified.
    a. Hinge Attachment: Stiles and rails to be continuously glue bonded to the core so that screw stress is transmitted directly to the core.
    b. Closure, Exit Device and Other Surface Mounted Hardware: Provide top rail 2-1/2" or more in width to hold closer fasteners and solid wood blocking for all other surface applied hardware.

B. Fire Rated Doors: Conform to "Flush Door" requirements specified above. Provide doors of U.L. classification indicated.

1. Reinforcement: Reinforce doors to receive hardware specified.
    a. Hinge Attachment: Triple ply stiles by MARSHFIELD. One half inch, high density inner stile by ALGOMA or equal by other listed manufacturers.
    b. Surface applied hardware that is located where screws cannot penetrate the above mentioned stiles or wood rails shall be through bolted.

D. Finish:

1. Comply with recommendations of WDMA for finish. Manufacturer to factory prep units for field stain. Color as selected by Architect.

E. Individually package doors at factory with manufacturer's standard packaging or wrapping for delivery to job site.

F. Manufacturer: MARSHFIELD DOOR SYSTEMS; EGGERS; ALGOMA; OSHKOSH; V T INDUSTRIES.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substances, rough openings and installation conditions. Do not proceed with wood door installation until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Verify metal frame dimensions and hardware mortises in metal frames with metal frame manufacturer.

3.03 INSTALLATION

A. Condition doors to average prevailing humidity in installation area before hanging.

B. Install doors in accordance with manufacturer's installation instructions. Job fit and prepare doors to receive hardware. Bevel 1/8" in 2" at strike edges for clearance in arc of swing. Seal cut surfaces, tops, bottoms and edges with sanding sealer after fitting and machining.

C. Hang doors straight, plumb and square securely anchored into position. Adjust doors to provide uniform clearance and to contact stops uniformly. Remove and replace doors that are warped, bowed or otherwise damaged and cannot be properly fit to the opening.

D. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA No. 80.

3.04 PROTECTION

A. Protect installed doors from soiling, staining and damage until final acceptance.

B. Repair or replace doors damaged beyond acceptable repair as directed by the Architect.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.01 SCOPE

A. Finish hardware for aluminum, hollow metal and wood doors. Included is:

1. Screws, bolts, and other fasteners required to install door hardware.
2. Special tools required to install and adjust door hardware.

1.02 RELATED SECTIONS

A. Alternate No. 1: Section 01 23 00.

B. Finish Carpentry (Hardware Installation): Section 06 10 00.

C. Hollow Metal Door Frames: Section 08 11 13.

D. Wood Doors: Section 08 14 00.

E. Aluminum Entrance Doors: Section 08 41 13.

1.03 QUALITY ASSURANCE

A. Supplier: A recognized building hardware supplier who has been furnishing hardware in the project's vicinity for not less than two years and who is or employs an Architectural Hardware Consultant (AHC), who will be available at no additional cost to the Owner during the course of construction.

B. Scheduling: Performed by an AHC member of Door and Hardware Institute (DHI).

1. The AHC shall be present at completion of the work; check the installation, make all minor adjustments required, and supervise required hardware replacements and report to the Architect on completeness of the installation.
2. Identify locksets and latchsets function by manufacturer's number on itemized schedule of hardware submitted for approval.

C. Reference Standards: Whenever the following abbreviations are used herein they shall refer to the corresponding standard:

1. American National Standards Institute (ANSI)
   a. ANSI 117.1: Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
   b. ANSI A156.1: Butts & Hinges - Grade 1.

c. ANSI A156.2: Locks & Lock Trim - Grade 1.
d. ANSI A156.3: Exit Devices - Grade 1.
e. ANSI A156.4: Door Controls, Closers - Grade 1.
f. ANSI A156.13: Mortise Locks & Latches - Grade 1.

2. Builders Hardware Manufacturers Association (BHMA)
   a. BHMA Product Standards: Latest Edition.
   b. BHMA Standard for Materials Finishes: Latest Edition.
3. Door and Hardware Institute (DHI)
   a. DHI Publication: Recommended Locations for Architectural Hardware.
   b. DHI Publication: Hardware for Labeled Fire Doors.
   c. DHI Publication: Supplement Hardware for Labeled Fire Doors.
4. ADA: Americans with Disabilities Act, Title III.

C. Codes and Regulations: All hardware listed or furnished shall meet requirements of Federal, State and Local codes having jurisdiction over this installation.

1. Any item furnished that does not meet code requirements, shall be removed and proper items substituted at no additional cost or expense to the Owner.

1.04 SUBMITTALS

A. Schedules: Submit detailed finish hardware schedule in accordance with Section 01 33 23. Schedule shall be complete and include product type, manufacturer's name and model number, and finish of every item required.

B. Product Data Sheets: Submit copies of manufacturer's catalog cut sheets for every item that is detailed in the finish hardware schedule in accordance with Section 01 33 23.

C. Samples: Submit one sample of each item of finish hardware included in your schedule for inspection and approval. Samples may later be used on project.

D. Templates: Furnish templates for fabrication of the following related work not included in this section: hollow metal doors and frames, aluminum doors and frames, wood doors, and any other related work areas.

E. Keying Schedule: Submit keying schedule for approval in accordance with DHI's Keying Systems and Nomenclature Handbook.

F. Operation Manuals: Furnish operation and maintenance manuals to owner.

G. Certification: Submit notarized certification indicating that hardware furnished for labeled doors and doors requiring physically handicapped access complies with requirements of governing authorities and applicable regulations.

1.05 DELIVERY, STORAGE AND HANDLING

A. Package each item of hardware and each lockset, complete with all necessary

screws, anchors, instruction and installation templates. Identify packages by indexing with corresponding item number of the Hardware Schedule.

B. Deliver packaged hardware items at proper time for installation. Provide secure locked storage for hardware. Control handling of items that are not immediately replaceable to prevent delays due to hardware loss.

C. Contractor and hardware supplier shall jointly inventory hardware when delivered to job site for agreement with the hardware schedule and promptly report errors or discrepancies to the Architect.

D. Store, handle and install hardware in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration.

1.06 PROJECT CONDITIONS

A. Examine detail drawings and provide fittings to details as required.

B. Provide all necessary material templates of physical hardware to required fabricators of doors, door frames and other work requiring factory preparation for hardware installation. Upon request, check shop drawings of such other work to confirm adequate provisions are made for proper installation of hardware.

C. Meet with Architect and Owner's personnel on request, to establish final keying requirements.

1.07 WARRANTY

A. Warranty

1. All hardware items, except for those listed below, shall have a written one year limited warranty against defects in workmanship and operation.
2. Manufacturers of hardware assume no responsibility or liability of items that are improperly handled, installed, or maintained.
3. The hardware items listed below shall carry the following standard warranties:
   a. Manual Door Closers: 10 year warranty
   b. Exit Devices: 3 year warranty
   c. Warranty Period for Locks: 7 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. To the greatest extent possible, furnish all finish hardware of a specific item from only one manufacturer. All numbers and symbols used in the preparation of the following schedule have been taken from the current catalogs of the following manufacturers. **See 2.03.A this section for Owner required cores.**

1. Butts: HAGER.
2. Locksets and Latchsets: BEST, SCHLAGE.
3. Trim: ROCKWOOD.
4. Stops and Holders: ROCKWOOD.
5. Closers: DORMA, LCN.
6. Thresholds, Gaskets, Sweeps and Automatic Door Bottoms: HAGER, NATIONAL GUARD.
7. Exit Devices: DORMA, VON DUPRIN.
8. Flush Bolts: ROCKWOOD
9. Overhead Door Stops: GLYNN-JOHNSON.

B. Other Manufacturers: Hardware of the same types, weight and function, approved by Architect, and as manufactured by the following manufacturers may be bid; except NO SUBSTITUTIONS unless pre-approved by the Owner on the following:

1. Butts: STANLEY, McKINNEY.
2. Locksets and Latchsets: CORBIN-RUSSWIN, SARGENT.
3. Trim: BROOKLINE, HAGER, IVES.
4. Stops and Holders: GLYNN JOHNSON, IVES, HAGER.
5. Closers: NORTON.
6. Thresholds, Gaskets, Sweeps and Automatic Door Bottoms: PEMKO, REESE.
7. Exit Devices: PRECISION.
8. Flush Bolts: BALDWIN, IVES.
9. Overhead Door Stops: RIXSON, ABH.

2.02 MATERIALS AND COMPONENTS

A. Criteria Schedule: The standard type, function, finish and quality set forth in the hardware schedule is as follows:

B. Locksets and Latchsets: SCHLAGE L Series, 03A (lever) design. 626 finish.

1. Mortise locksets shall have an anti-friction latchbolt. One piece latchbolts are unacceptable.
2. Mortise locksets shall have sectional lever trim of the design and type as listed in the schedule.
3. Provide inside lever handle secured in place by a dowel screw and outside lever handle (secure side) pinned to the spindle.

C. Exit Devices: VD 99 Series

1. All exit devices shall be of one manufacturer.
2. Exit devices shall be furnished non-handed and capable of direct field conversion for all available trim functions.
3. Exit devices shall be UL listed for Accident Hazard. Fire exit devices shall carry an A label for the following products and maximum dimensions listed below:
   a. Rim and Mortise Exit Devices:
      4'-0" x 8'-0" single doors

8'-0" x 8'-0" pairs of doors

b. Surface and Concealed Vertical Rod Exit Devices
   4'-0" x 10'-0" single doors
   8'-0" x 10'-0" pairs of doors

c. Wood Door Concealed Vertical Rod Exit Devices
   4'-0" x 9'-3" single doors
   8'-0" x 9'-3" pairs of doors

4. Design: Push through type touch pad design with a straight or horizontal motion to eliminate pinch points.
5. Latch bolt shall have a self-lubricating coating that reduces friction and wear. Plated latch bolts are unacceptable.
6. Surface and concealed vertical rod exit devices: Incorporate a latch retraction feature, which shall hold both the top and bottom latchbolts in the retracted position while the door is open. Pullman latches or bottom latchbolt retraction only are not acceptable.
7. Finish: 626 .

D. Butts: Standard weight, five-knuckle, wrought steel or bronze. Pins in non-ferrous butts to be stainless steel and plain steel in all ferrous hinges. Provide all pins of non-rising type with a hole through the plug to facilitate pin removal. Provide all hinges with Phillips head screws.

1. All hinges on outswinging exterior doors [and doors located in Natatorium] shall be bronze base metal. Interior hinges shall be steel base metal, unless otherwise indicated.
2. Provide non-removable pin (NRP) feature on exterior outswinging doors and where specified.
3. 626 finish.
4. Provide ball-bearing type hinges on all doors with closers.
5. Hinge Sizes: Unless otherwise listed in Hardware Sets, provide the following:
   a. Doors Up to 3'-0" Wide: 4-1/2"h x 4-1/2"w.
   b. Doors Over 3'-0" Wide: 5"h x 4-1/2"w.

E. Door Closers: LCN 4011/4111

1. All door closers shall be the product of one manufacturer.
2. Shell: Cast iron or cast aluminum.
3. Full rack-and-pinion type.
4. Closer piston and spring bores shall be minimum 1-1/2" in diameter. Closer with smaller bores are not acceptable.
5. Closers shall be controlled by two springs: a main spring and a booster spring. Door closers having only one spring shall not be acceptable.
6. Provide closers with multi size spring power adjustment within the following ranges:
   a. Exterior Doors: sizes 2 through 6.
   b. Interior Doors: sizes 1 through 4.
   c. Fire Doors: sizes 2 through 6.
7. Provide closers with two non-critical valves, hex-key-adjusted, to independently regulate sweep and latch speed. Closers shall have

backcheck cushioning and backcheck positioning controlled by a hex-key valve. All adjusting valves shall be zinc or brass, accessible from the front of the door closer. No plastic adjusting valves shall be permitted.

8. Closers shall be packaged with arms, shoes, and accessories for regular arm, top jamb, and parallel arm mounting installations.
9. Regular arm and top jamb mounted door closers shall have a non-hold-open shoe permitting a 15% (+/- 7-1/2%) power adjustment.
10. Finish: Shop paint; color as selected by Architect.
11. Additional Door Closer Clarifications
    a. Closer Delay: Provide closers such that the sweep period from a 70 degree open position to 3" from the latch will not take less than 3 seconds, per ADA 4.13.10.
    b. Door Opening Force: Provide interior doors with a maximum opening force of 5 LBF per ADA 4.13.11.

F. Wall Stops: ROCKWOOD 409. Provide wall mounted type on all doors. Where wall types are not applicable, provide overhead stops. Check at site for proper type after doors are hung and as approved by Architect. 626 or 630 finish.

G. Overhead Stops and Holders: GJ #1 Series

1. Provide channels and slide members manufactured from brass, bronze or stainless steel. No plastic slide members permitted.
2. End caps for channels shall be manufactured from steel. Plastic end caps are not acceptable.
3. Operation: Engage and release door automatically by roller cam action with provision for a control knob at the bottom of the channel to engage or disengage hold-open action.

H. Fasteners

1. Manufacture hardware to conform to published templates; generally prepared for machine screw installation.
2. Furnish screws for installation, with each hardware item. Provide Phillips flat head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match the hardware finish, or if exposed in surfaces of other work, to match the finish of such other work as closely as possible.
3. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard manufactured units of the type specified are available with concealed fasteners.

I. Kick Plate: 8" high by 1-1/2" less than width of door, 1" less than width of pair of doors; .050" thickness. 630 finish.

J. Thresholds: NATIONAL GUARD 513; aluminum, maximum 1/2" high, with stainless steel fasteners. Conform to ANSI 117.1 and ADA Requirements.

K. Weatherstripping: NATIONAL GUARD 110N; extruded aluminum with neoprene insert.

L. Automatic Door Bottom: Surface mounted, neoprene seal with extruded aluminum housing. NATIONAL GUARD 420.

M. Rubber Silencers: Furnish as required for hollow metal frames. 3 per each single door, 2 per each leaf of each pair of doors.

N. Sweeps: NATIONAL GUARD 198N. Aluminum retainer with neoprene sweep.

O. Flush Bolts: ROCKWOOD 555 (HM) 557 (wood); 12” rod length; 1-3/4” thick door and 1880 dust proof strike.

P. Coordinator: ROCKWOOD 1600 Series. Non-handed type; provide with matching filler to fill opening width. Field paint to match hollow metal door frame. Provide with mounting brackets.

Q. Roller Catch: ROCKWOOD 592; adjustable type; with strike.

R. Push Plate: ROCKWOOD 70E x 16; 6” x 16” x .050”; bevel edges and square corners. 630 finish.

S. Pull/Plate: ROCKWOOD 107 x 70C; 4” x 16” plate with 3/4” round x 8-3/4” pull. 630 finish.

2.03 KEYING

A. Match Owner's existing keying system. Provide Best Lock IC cores (no substitute).

B. Final keying requirements shall be determined by the owner or the owner's agent in a meeting with the hardware supplier for the project.

C. An Architectural Hardware Consultant shall be available to assist the owner in making final keying decisions for the project.

D. Allow for 150% expansion of the keying system for any future additions, and provide with capacity for the project and the expansion mentioned above.

E. Provide a construction masterkey system to be used during the construction phase of the project.

F. All grand master and master keys shall be sent directly to the owner, via registered mail.

G. Furnish the following number of keys:

1. Construction keys: 12 total.
2. Change keys: 3 per lock.
3. Grand master keys: 5 total.
4. Master keys: 10 total.

2.04 HARDWARE SETS

A. General

1. Quantities listed under each hardware set number are for each door or pair of doors.
2. This schedule is intended to indicate the general quality and type of hardware required for the particular opening listed, but such description or schedule shall not be construed to denote that no other items of hardware will be required for the project.

B. Hardware Sets

1. The hardware schedule is itemized at the end of this section.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mount hardware units at heights recommended by DHI "Recommended Locations for Builders Hardware".

B. Install hardware in strict compliance with manufacturer's instructions. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as required for proper installation and operation.

1. Install mortised items flush with surface of doors and frames.
2. Install locksets, exit devices, door closers, and trim after painting is completed.

C. Upon completion, properly tag and identify keys and deliver to the owner or the owner's agent.

D. Closers

1. Exterior Doors: Install on interior side.
2. Corridor Doors: Install on room side not visible from corridors, lobbies and other public spaces.

E. Door Stops: Install wall mounted type or overhead mounted type as required on swing doors to limit travel and avoid damage to trim or adjacent wall.

F. Thresholds: Install on all exterior doors; include even if not indicated on door schedule or hardware sets. Install in bed of sealant on both legs of threshold.

G. Weatherstripping: Install on head and jambs of all exterior hollow metal doors; include even if not indicated on door schedule or hardware sets.

H. Sweeps: Install on all exterior hollow metal doors; include even if not indicated on door schedule or hardware sets.

I. Kickplates: Install on push side of door centered horizontally and one inch from bottom of door. Install on both sides of door where scheduled.

3.02 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of each unit. Lubricate moving parts with type of lubricant recommended by manufacturer. Replace units that cannot be adjusted or lubricated to operate freely and smoothly.

1. Adjust door closers for proper and smooth operation. All barrier-free closers shall be adjusted to meet the required opening force criteria.

B. Make final adjustment cleaning and lubricating, just before occupancy. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Instruct Owner's designated personnel in proper adjustment and maintenance of hardware and hardware finishes during final adjustment of units.

3.03 HARDWARE SCHEDULE

A. The minimum standards for quality of material and fabrication of all components are outlined in 1.03 Quality Assurance and Part 2 Products.

B. The hardware schedule (prepared by the Architectural Hardware Consultant listed below) has determine the minimum grade level of quality of materials for all project specific conditions, locations, intended use and finish:

David Scott, AHC/CDT
McCarthy Jones and Woodard, LLC
650 Southgate Avenue
Nashville, TN 37203

SCHEDULE

Refer to Section 01 23 00 for Alternate No. 1; and coordinate with the drawings for the base bid and alternate scopes of work.

Manufacturers:

Hager:	(1)
Schlage:	(2)
LCN:	(3)
Von Duprin:	(4)
Best:	(5)

BASE BID

Set 1

Door 100.1, 100.6

Each to receive:

6 Hinges BB1191 4 ½ x 4 ½ NRP 26D	(1)
2 Rim Panics 99L-996L 03A 626	(4)
1 Hardware Mullion KR4954	(4)
3 Cylinders	(5)
2 Closers 4111 CUSH TBWMS AL	(3)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
2 Sets Weatherstrip 891V 36” x 84” AL	(1)
1 Threshold 520SN 72” AL	(1)
2 Door Bottoms 789SW 36” AL	(1)
1 Rain Drip 810S 76” AL	(1)

Set 2

Door 100.2, 100.5, 108.3

All hardware by door supplier

Set 3

Door 100.3, 100.4, 101.1, 108.2, 109.3, 109.4

Each to receive:

3 Hinges BB1191 4 ½ x 4 ½ NRP 26D	(1)
1 Rim Panic 99L-996L 03A 626	(4)
1 Cylinder	(5)
2 Closers 4111 CUSH TBWMS AL	(3)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Set Weatherstrip 891V 36” x 84” AL	(1)
1 Threshold 520SN 36” AL	(1)
1 Door Bottom 789SW 36” AL	(1)
1 Rain Drip 810S 40” AL	(1)

Set 4

Not Used

Set 5

Door 101.2

Each to receive:

6 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
2 Rim Panics 99L-996L 03A 626	(4)
1 Hardware Mullion KR4954	(4)
3 Cylinders	(5)
2 Closers 4111 TBWMS AL	(3)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
2 Wall Stops 236W 32D	(1)

Set 6

Door 102.1, 103.1

Each to receive:

3 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Push Plate 30S 4 x 16 32D	(1)
1 Pull Plate 36N 4 x 16 32D	(1)
1 Closer 4111 TBWMS AL	(3)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Wall Stop 236W 32D	(1)

Set 7

Door 104.1, 105.1

Each to receive:

3 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Classroom Lock L9070 03A 626	(2)
1 Cylinder	(5)
1 Closer 4111 TBWMS AL	(3)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Wall Stop 236W 32D	(1)

Set 8

Door 106.1

Each to receive:

6 Hinges BB1191 4 ½ x 4 ½ NRP 26D	(1)
1 Mortise Storeroom Lock L9080 03A 626	(2)
1 Cylinder	(5)
2 Flush Bolts 282D 26D	(1)

2 Closers 4111 CUSH TBWMS AL	(3)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
1 Set Weatherstrip 891V 72” x 84” AL	(1)
1 Threshold 541SN 72” AL	(1)
1 Rain Drip 810S 76” AL	(1)

Set 9

Door 107.1, 100A.2

Each to receive:

3 Hinges BB1191 4 ½ x 4 ½ NRP 26D	(1)
1 Mortise Storeroom Lock L9080 03A 626	(2)
1 Cylinder	(5)
1 Closer 4111 CUSH TBWMS AL	(3)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Set Weatherstrip 891V 36” x 84” AL	(1)
1 Threshold 541SN 36” AL	(1)
1 Rain Drip 810S 40” AL	(1)

Set 10

Door 108.1, 109.1, 109.2

Each to receive:

6 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Classroom Lock L9070 03A 626	(2)
1 Cylinder	(5)
2 Flush Bolts 282D 26D	(1)
2 Closers 4111 CUSH TBWMS AL	(3)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
2 Wall Stops 236W 32D	(1)

Set 11

Door 106.2 OMITTED

ALTERNATE No. 1

Set 12

Door 114.1, 115.1

Each to receive:

3 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Entry Lock L9050 03A 626	(2)
1 Cylinder	(5)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Wall Stop 236W 32D	(1)

Set 13

Door 118.1

Each to receive:

3 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Classroom Lock L9070 03A 626	(2)
1 Cylinder	(5)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Wall Stop 236W 32D	(1)

Set 14

Door 116.1, 117.1

Each to receive:

6 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Classroom Lock L9070 03A 626	(2)
1 Cylinder	(5)
1 Dummy L0172 03A 626	(2)
2 Flush Bolts 282D 26D	(1)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
2 Wall Stops 236W 32D	(1)

END OF SECTION

SECTION 08 81 00

GLASS GLAZING

PART 1 GENERAL

1.01 SCOPE

A. Work Included: Provide glass and glazing for all interior and exterior openings.

B. Work Not Included: Glass and glazing not provided under this Section are as follows:

1. Framed Mirrors: Section 10 28 13.

1.02 RELATED SECTIONS

A. Glazing in Aluminum Framing: Section 08 41 13.

1.03 QUALITY ASSURANCE

A. Glazing Installation Methods: Comply with Flat Glass Marketing Association (FGMA) "Glazing Manual".

B. Installation: Performed only by experienced glaziers.

C. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

1. ANSI: American National Standards Institute.
2. ASTM: American Society for Testing and Materials.
3. GANA: Glass Association of North America.
4. IGMA: Insulated Glass Manufacturers Alliance.

D. Safety Glass Standards: ANSI Z97.1.

1.03 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of glass, glazing sealants and accessories required.

B. Submit insulating and laminated glass manufacturer's certification indicating units meet or exceed specified requirements.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle glazing materials in accordance with manufacturer's recommendations to prevent damage and deterioration.

1.05 PROJECT CONDITIONS

A. Field verify measurements and conditions of installations.

B. Examine all details. Provide proper fitting for details indicated.

C. Do not perform work under adverse weather or job site conditions. Install liquid sealants when temperatures are within lower or middle third of temperature range recommendations by manufacturer.

D. Protect work from damage during and after installation until project acceptance.

1.06 WARRANTY

A. Insulating Glass: Submit manufacturer's written warranty that for ten years from date of substantial completion, a replacement will be provided (furnished and installed) for any unit which develops edge separation, thermal stress cracks, or other defects which materially obstruct vision through the glass or affect thermal and physical integrity of insulating glass units, except warranty shall not cover glass breakage from other than natural causes. Defective units shall be replaced at no additional cost to the Owner.

B. Coated Glass: Submit manufacturer's written warranty that for five (5) years from date of substantial completion, a replacement will be provided for defective units. Defects are defined as peeling, cracking or deterioration in coating due to normal conditions and not due to handling or installation contrary to glass manufacturer's published instructions. Defective units shall be replaced at no additional cost to the Owner.

C. Mirror: Submit manufacturer's five (5) year warranty against silver spoilage. A replacement will be provided for mirrors that develop visible defects. Defective units shall be replaced at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 GLASS

A. General: New, bearing manufacturer's label.

B. Acceptable Manufacturers and Fabricators: Specifications herein are based on glass and materials manufactured or fabricated by the following manufacturers. Not all firms listed manufacture or fabricate all the items specified herein. However, to ensure consistent quality of appearance and performance, provide each type or kind of glass or material from a single source. Manufacturers for specialty products are listed within the specification to establish a particular type, color, pattern, etc. Equal products by the manufacturers listed are acceptable providing they meet the type, color, pattern, etc. as approved by the Architect.

1. AGC FLAT GLASS NORTH AMERICA
2. VIRACON
3. PPG
4. GUARDIAN INDUSTRIES
5. INTERPANE
6. ACH FLOAT GLASS
7. OLDCASTLE GLASS

C. Type

1. Float or Plate
   a. General: Transparent window glass.
   b. Conformance: Type I, Class 1, Quality q3, conforming to ASTM C1036.
   c. Thickness: 1/4 inch.
   d. Color: Clear
2. Tempered
   a. General: Transparent safety glass.
   b. Conformance; Kind FT, Condition A, Type I, Class 1, , conforming to ASTM C1048.
   c. Thickness: 1/4 inch.
   d. Color: Clear
3. Insulating Glass - Type 1
   a. Type: Two thicknesses of tempered glass conforming to requirements stated hereinbefore.
   b. Color: Clear, both panes.
   c. Thickness: 1/4 inch each pane.
   d. Air Space: 1/2 inch.
   e. Unit Thickness: 1 inch.
   f. Thermal Conductance (U-Value): 0.56 maximum.

D. Fabrication

1. Tempered
   a. Provide treated glass strengthened to not less than 4 to 5 times annealed glass strength.
   b. Cut glass to required size before tempering. Comply with glass tempering recommendation.
2. Insulating Glass: Manufacturer's standard double pane glazed insulating glass construction, separated by a spacer, hermetically sealed with Class A sealant-type edge construction; dry air of glass filled air space with minus 20 degrees F., dew point.
   a. Fabricate insulating glass units meeting certification requirements of ASTM E774 as performed by IGCC for a Class A rating. Provide units IGCC labeled.
   b. Edge Construction: Twin primary seals of polyisobutylene; welded or soldered sealed corners, and filled with desiccant; and secondary seal outside of bar, bonded to both sheets of glass and bar, or hyposulfite, silicone or halogenate butyl elastomeric sealant.

c. Warranty: Provide manufacturer's standard ten year product warranty on maintained hermetic seal.

2.02 GLAZING MATERIALS AND ACCESSORIES

A. Glazing Sealants and Compounds

1. Comply with manufacturer's recommendations for selection of hardness. Select materials and variations or modifications for compatibility with surfaces contacted in the installation.
2. One part silicone rubber glazing sealant, complying with ASTM C920, Class A, non-sag. Provide acid type recommended by manufacturer; where one or more porous bond surfaces are contacted.
3. Preformed Butyl Rubber Glazing Sealant: Compound of polymerized butyl rubber and inert fillers, with or without polyisobutylene modification, solvent based, 95% solids, formed and coiled on release paper, tack-free in 24 hours, paintable, non-staining, plain preshimmed or reinforced as required for proper installation and setting of glass.

B. Miscellaneous Glazing Materials:

1. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
2. Setting Blocks: Neoprene or EPDM, 70-90 durometer hardness, with proven compatibility with sealants used.
3. Spacers: Neoprene or EPDM, 40-50 durometer hardness with proven compatibility with sealants used.
4. Compressible Filler (Rod): Closed cell or waterproof jacketed rod stock of synthetic rubber or plastic form, compatible space with sealants used, flexible and resilient, with 5-10 psi compression strength for 25% deflection.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, substructure and installation conditions. Do not proceed with glazing work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Protect glass from edge damage at all times during and after installation. Do not cut, seam, nip or abrade tempered glass.

B. Inspect each piece of glass immediately before installation and eliminate any which have observable edge damage or face imperfections.

C. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw, and bow oriented in same direction as other pieces.

D. Clean glazing channels and other framing members to receive glass immediately before glazing. Remove loose coatings. Apply primer to joint surfaces receiving sealants when recommended by sealant manufacturer.

3.03 INSTALLATION

A. Comply with combined recommendations and technical reports of manufacturer's of glass and glazing materials used with GANA "Glazing Manual", except when more stringent requirements are indicated.

B. Install insulating units to comply with recommendations by IGMA, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

C. Glazing channel dimensions shown are intended to provide for necessary bite on glass, minimum edge clearance and adequate sealant thickness, with reasonable tolerance. Adjust as required by job conditions at time of installation.

D. Install setting blocks of proper size at quarter points of sill rabbet. Provide spacers as required.

E. Install sealants, tapes, and gaskets in accordance with manufacturer's recommendations. Set glass without springing and install securely to prevent rattling or breakage.

F. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

G. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, to eliminate dirt and moisture pockets.

H. Clean and trim excess glazing materials from glass and stops or frames promptly after installation to prevent stains and discolorations.

3.04 FIELD QUALITY CONTROL

A. Watertight and airtight installation of exterior glass and glazing required. Each installation shall withstand normal temperature changes, wind loading, impact loading (for operating doors) without failure including loss or breakage of glass, failure of sealants of gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.

B. Repair glazing installation at leaks or, if leakage is excessive, replace glazing sealants and gaskets as directed.

3.05 PROTECTION AND CLEANING

A. Protect glass from breakage immediately upon installation by attachment of streamers to framing held away from glass. Do not apply markers of any type to surfaces of glass. Remove non-permanent labels and clean surfaces.

B. Maintain glass in a reasonable clean condition during construction so that it will not be damaged by corrosive action, and will not contribute (by wash off) to the deterioration of glazing materials and other work. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents and vandalism.

C. Wash and polish on both faces not more than four days before acceptance of the work. Comply with glass manufacturer's recommendations for final cleaning.

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD SYSTEMS

PART 1 GENERAL

1.01 SCOPE

A. Provide gypsum board systems consisting of wall board and framing as indicated and specified. Work includes:

1. Gypsum drywall wall systems.
2. Suspended drywall ceilings and soffits including suspension framing system.
3. Fire-rated gypsum drywall construction where indicated.
4. Exterior gypsum board sheathing.
5. Edge trim, corner beads, control joints, accent reveals, fasteners, joint treatment materials and other accessories required for a complete installation.
6. Includes installation of acoustical insulation specified in Section 07 21 00.

1.02 RELATED SECTIONS

A. Acoustical Panel Ceilings: Section 09 51 13.

B. Acoustical Insulation: Section 07 21 00.

1.03 QUALITY ASSURANCE

A. Gypsum Board Systems: Comply with ASTM C840 "Application and Finishing of Gypsum Board", and as specified.

B. Metal Framing System: Comply with ASTM C754 "Installation of Steel Framing Members to Receive Screw Attached Gypsum", and as specified.

C. Reference Standards: Wherever the following abbreviations are used herein they shall refer to the corresponding standard:

1. ASTM: American Society for Testing and Materials.
2. GA: Gypsum Association.

D. Fire-Rated Construction: Comply with fire resistance ratings indicated on drawings and as required by governing authorities and codes. Provide materials, accessories and application procedures that have been listed by Underwriters Laboratories or tested in accordance with ASTM E119 for the type of construction shown.

E. Guarantee: Submit written guarantee stating that cracks, delaminations or other imperfections in the drywall work which may develop within a period of 2 years from

date of acceptance will be repaired at no cost to the Owner.

F. Pre-Installation Conference: Conduct a pre-installation conference at Project site to review manufacturer's recommendations and referenced requirements for locating control joints in gypsum board walls and ceilings a minimum of one (1) week prior to beginning this portion of the Work. Have manufacturer's representative, contractor's representative and Architect present at this meeting. Conduct this conference to comply with requirements as outlined in Section 01 31 19, Project Meetings.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each gypsum board system component.

B. Submit manufacturer's certification that fire-rated assemblies proposed meet project requirements, including evidence of approved test reports acceptable to governing building code enforcing authorities, that assemblies when installed with proposed materials, will meet or exceed fire ratings required.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened labeled containers.

B. Store, protect and handle materials in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration. Protect cold-formed metal framing from corrosion, deformation and other damage during delivery, storage and handing per requirements of AISI's "Code of Standard Practice".

1. Protect adjoining surfaces against damage and soiling.

1.06 JOB CONDITIONS

A. Coordinate installation sequencing with work of other trades.

1. Verify completion of other work, including that of other trades, which will be concealed by gypsum drywall construction before installation of wallboard.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Gypsum Board: U.S. GYPSUM CO.; CELOTEX CORP.; FLINTKOTE CO.; GEORGIA-PACIFIC CORP.; GOLD BOND BUILDING PRODUCTS; DOMTAR GYPSUM.

B. Studs, Framing and Furring: DIETRICH; MARINO/WARE; CLARKWESTERN BUILDING SYSTEMS; STATE BUILDING PRODUCTS; gypsum board

manufacturers listed above.

C. Others as listed for specific products.

2.02 STEEL STUDS

A. Type: Screw type "C" shape, roll formed sheet steel members conforming to requirements of ASTM C645.

1. Material: ASTM A653 steel with minimum yield strength of 33 ksi.
2. Finish: Hot-dip galvanized coating, complying with ASTM A653 G40.
3. Gage and Width
   a. 25 gage x 3-5/8": Up to and including 14'-6" high.
   b. 20 gage x 3-5/8"
      1) Over 14'-6" up to and including 16'-5" high
      2) At wall mounted cabinet locations
      3) At walls receiving ceramic tile
   c. 20 gage x 4": Over 16'-5" up to and including 17'-6" high
   d. 20 gage x 6": Over 17'-6" up to and including 24'-0".
   e. 16 gage at door jambs, heavy equipment locations, and interior partitions receiving masonry veneer.
   f. Provide other gages or widths as indicated on drawings.
4. Thickness: Nominal 1-1/4".

B. Runners and Tracks: Designed and sized to receive studs. Gage to match studs except deflection tracks.

1. Ceiling Deflection Track: Provide one of the following:
   a. #53 FlexTrack, 20 gage typical, by SUPERIOR METAL TRIM PRODUCTS
   b. 20 gage top track with 2” minimum legs and 20 gage Spazzer 9200 Stud Spacer Bar by Dietrich Metal Framing
   c. Slip Track (Slp Trk) by BRADY CONSTRUCTION INOVATIONS
   d. The System by METAL-LITE
   e. The Three Legged Dog by FLEX-ABILITY CONCEPTS.
   f. A double slip track, 20 gage, can be used in lieu of the proprietary deflection tracks specified above. Legs of tracks shall be minimum 2".

C. Backing Plates (Blocking): Steel sheet for blocking; width to fit framing spacing; height to be 6” unless otherwise indicated.

1. Base Metal Thickness: Minimum 0.0598”.

D. Special Corner Plates: 20 gage galvanized sheet metal break metal; 5” x 5” x continuous length; one-piece. Provide at corner where studs cannot fill corners (i.e. 60 degrees corners, etc.).

2.03 CEILING/SOFFIT SUSPENSION SYSTEM

A. Provide the following materials unless otherwise indicated on the drawings. Metals used in exterior or areas subjected to moisture to be hot-dipped galvanized in accordance with ASTM A653 or A123 as applicable.

1. Main Runners: Cold-rolled steel channels; not less than 16 gage; G-90 galvanized finish for exterior and moist areas, black asphaltum painted for other areas. Spacing as required, but not to exceed 48" o.c.
   a. 1-1/2" deep where structural support framing is at 48" o.c. or less.
   b. 2" deep where structural support framing is over 48" and less than 66" o.c.
2. Cross Furring
   a. Cold-rolled steel channels, not less than 16-gage; 3/4" size; same finish as main runners.
   b. Hat shape, 7/8" deep, 25-gage. ASTM A653 G-60 hot-dipped galvanized.
   c. 2-1/2" x 20-gage, G-60 galvanized steel studs. Provide for multiple layer applications. Provide 12" long nested studs at suspension points.
3. Wire: Stainless steel 304 alloy for exterior conditions; galvanized soft annealed steel wire for interior conditions. Galvanized coating to meet or exceed Fed. Spec. QQ-W-461, Class 1.
   a. Tie Wire: Minimum 16-gage.
   b. Hanger Wire: Minimum 8-gage.

B. Optional Framing: At contractor's option, proprietary furring system may be used in lieu of black iron system for dry interior conditions without fire-rated requirements.

1. Description: System consisting of furring runners, furring tees, cross tees and hanger wires, designed and manufactured specifically for suspending gypsum board ceiling.
   a. Non-fire rated.
   b. Electrogalvanized, cold-rolled steel, 0.020" thick.
   c. Double web members; 1-1/2" high with 1-3/8" capped face.
2. Manufacturer: 640 System by CHICAGO METALLIC CORP.; Drywall Suspension System by USG, WORTHINGTON STEEL COMPANY, Watercheck LaFARGE GYPSUM.
3. Reference: ASTM C635, heavy duty.

2.04 METAL FURRING

A. Type: Galvanized steel, hat-section channel, unless otherwise indicated; 7/8" furring depth by 1-1/4" face width.

B. Manufacturer: DIETRICH Type FCE equal by CLARKWESTERN BUILDING SYSTEMS, MARINO/WARE, or by other gypsum board manufacturers listed in 2.01A.

C. Reference: ASTM C645.

2.05 GYPSUM BOARD

A. General: Comply with ASTM C1396.

B. Fire Rated Board: Type “C” or "X" (special fire retardant) to meet fire ratings for construction shown. Tapered edges. Thickness 5/8" unless otherwise indicated. Use at all locations indicated as meeting a specific fire resistance rating.

C. Moisture and Mold Resistant

1. ASTM C1396 (Section 5), regular type except where Type X fire-resistant type is indicated or required to meet UL assembly types.
2. Edges: Tapered.
3. Thickness: 5/8 inch, unless otherwise indicated.
4. Acceptable products: Mold Tough and Mold Tough Firecode (Type X) by USG; DensArmor Plus and DensArmor Plus Firecode (Type X) by GEORGIA-PACIFIC or equal by other gypsum board manufacturers listed in 2.01A.
5. Water Absorption: ASTM C473, the average water absorption for panels is not greater than 5 percent by weight after two-hour immersion.
6. Resistance to Mold Growth: ASTM D3273, “Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber,” the panel score was 10.
7. Use on non-ceramic tiled walls, ceilings and soffits in toilet rooms, shower rooms and drying rooms; on ceramic tiled non-wet walls in toilet rooms; walls and partitions above ceilings

D. Exterior Sheathing Board: Use for exterior sheathing and other areas where indicated on drawings. Provide in conformance with ASTM C1177, water repellent treated core and fiberglass face sheets. Dens-Glas by GEORGIA-PACIFIC or GlasRoc by BPB. 5/8" thickness unless otherwise indicated.

E. Impact Resistant Gypsum Wallboard: ASTM C1396 and ASTM C1278, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels, with core type and in thickness indicated, and with long edges tapered. Provide where indicated.

1. Minimum Physical Properties:
   a. Thickness: 5/8 inch.
   b. Screw Withdrawal (lbg): .104.
   c. Flexural Strength (lbf): 200.
   d. Fire Hazard Classification: Flame spread 5, smoke developed 0.
   e. Surface Abrasion (ASTM D4977: 25 pound weight, 50 cycles): 0.090 inch.
   f. Surface indentation (ASTM D5420): 0.14 inch.
   g. Soft Body Impact (ASTM E695)
      1) Surface Failure: 175 feet – pounds.
      2) Deformation Failure: 225 feet – pounds.
      3) Structural Failure: Greater than 300 feet – pounds.
2. Manufacturers: VHI Fiberock by USG, Hi-Impact 1000 by NATIONAL GYPSUM COMPANY, Tough Rock by GEORGIA PACIFIC or equal by

other gypsum board manufacturers listed in 2.01A.

F. Standard Board: 5/8" thick unless otherwise indicated. Tapered edges. Use at all locations except those indicated to receive a specific type of board.

G. Gypsum Liner Board: ASTM C442, Type X, 1" thick gypsum core with moisture resistant faces.

H. Tile Backer Board: See Section 09 30 00.

2.06 ACCESSORIES

A. Fasteners: Drywall screws and metal framing screws per manufacturer's instructions and recommendations for type and size, based on construction and conditions involved.

B. Trim

1. Corner Beads - Outside, Square Corners: 1-1/4 inch x 1-1/4 inch heavy gauge galvanized steel or vinyl, perforated.
   a. Metal: BEADEX MANUFACTURING; DIETRICH METAL FRAMING; CLARKWESTERN BUILDING SYSTEMS; listed gypsum board manufacturers
   b. Vinyl: VINYL TECH; VINYL CORP.
2. Corner Beads - Outside, Non-square Corners: BEADEX B-1 Splay Flexible Corner or equal. Concealed metal; two galvanized continuous strips laminated with paper trim; for application without mechanical fasteners.
3. Exposed Edges (Casing Beads): L-shaped trim, size to suit wallboard. J-shaped bead not permitted.
   a. Metal: DIETRICH METAL FRAMING M20B; BEADEX; DALE INDUSTRIES; listed gypsum board manufacturers.
   b. Vinyl: VINYL CORP. SB; VINYL TECH.
4. Control Joints
   a. Metal: Roll formed zinc, tape protected 1/4" wide x 7/16" deep control slot. DIETRICH No. 093; BEADEX; DALE INDUSTRIES; listed gypsum board manufacturers.
   b. Vinyl: VINYL CORP. No. CVJ-16; VINYL TECH. Tape protected 3/16" wide x 7/16: deep control slot.

C. Reinforcing Tape: Width to adequately cover joint.

D. Joint Taping Compound: Designed for bonding tape to wallboard and coating corner beads and fasteners.

1. Exterior Exposure: Type as recommended by board manufacturer.
2. Toxicity/IEQ: Lime compound. All purpose joint compound containing inert fillers and natural binders. Pre-mixed compounds shall be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds

E. Joint Topping Compound: Designed to sand smooth and feather well for finished

surface.

1. Exterior Exposure: Type as recommended by board manufacturer.
2. Toxicity/IEQ: Lime compound. All purpose joint compound containing inert fillers and natural binders. Pre-mixed compounds shall be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds

F. Additional Item: All additional accessories to complete work including nails and anchors to secure frames to walls and floors.

G. Acoustic Materials
1. Insulation: See Section 07 21 00.
2. Sealant: See Section 07 92 00.

PART 3 EXECUTION

3.01 GENERAL

A. Metal Furring and Framing: Comply with the requirements of ASTM C754 "Installation of Steel Framing Members to Receive Screw Attached Gypsum", and as specified.

B. Gypsum Board Systems: Comply with ASTM C840 "Application and Finishing of Gypsum Board", and as specified.

3.02 PREPARATION

A. Maintain uniform building temperature range not less than 55 degrees F., for 24 hours before, during and after gypsum panel installation and joint finishing treatment.

B. Provide adequate lighting and ventilation during installation and joint finishing treatment.

3.03 INSPECTION

A. Examine substrates and installation conditions. Do not proceed with gypsum wallboard work until unsatisfactory conditions have been corrected.

1. Protrusions of framing, twisted framing members, or unaligned members must be repaired before installation of wallboard is started.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.04 FRAMING INSTALLATION

A. Securely attach runner to floor with expansion anchors or other approved means.

B. Install all framing plumb and square with spacing as indicated.

C. Provide supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Company's "Gypsum Construction Handbook".

D. Bridging
   1. Up to 10 ft. Wall Height: 1 row.
   2. 10 ft. and Over Wall Height: 2 rows of bridging.

E. Provide a minimum of two (2) screws per connection.

F. Rated Stud Deflection Assembly: Install in accordance with manufacturer's instructions to provide required fire ratings. Ensure that anchoring devices, back-up material, clip supports and other materials are as used in referenced fire tests.

3.05 FURRING INSTALLATION

A. Ceiling Application: Install suspension system for ceilings and soffits, both interior and exterior, in accordance with manufacturer's instructions, shop drawings and as follows:

   1. Locate furring runners at 48" on center with hanger wires at 48" on center. Attach hanger wires to structural framing members specifically for this purpose. Attach hanger wires to framing wires using attachment devices whose suitability has been demonstrated by standard construction practice or by certified test data.
   2. Connect furring runners with furring tees spaced at 24" on center. Locate additional tees or hanger support as required for surface mounted and recessed ceiling and soffit items such as light fixtures, diffusers, etc. Add additional hanger wires as required to support all such items at each corner.
   3. Provide wall track wherever suspension meets a vertical surface.
   4. Brace suspension system for exterior ceilings and soffits to structure above to resist wind up-lift using metal channels or metal studs. Install after system is completely suspended to level plane.
   5. Do not support ceiling system from ductwork, electrical conduit, heating or plumbing lines, and vice versa. Each utility system and the ceiling system shall be a separate installation and each shall be independently supported from the building structure.
      a. If an interference occurs, provide trapeze type hangers or other suitable supports for each system. Locate hangers where they will not interfere with access to mixing boxes, fire dampers, valves and other appurtenances requiring servicing.

3.06 GYPSUM BOARD INSTALLATION

A. General

1. Pre-installation Conference: Before start of gypsum board installation, meet at the project site with the Architect and installers of related work, including work requiring openings, chases, frames, access panels, support, similar integrated requirements and mechanical and electrical trades. Review potential interferences and conflicts and coordinate layout and sequencing requirements for proper installation and integration of the work.
   a. Do not proceed with gypsum board installation until blocking, framing, bracing and other supports for subsequently applied work have been installed, reviewed and accepted by the Architect.
   b. Do not install gypsum board until work concealed by gypsum board has been installed.

B. Application

1. Install gypsum board face side out. Do not install imperfect, damaged or damp boards.
2. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.
3. Locate either edges or end joints over supports. Position boards so that both tapered edge joints abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
4. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.
5. Floating Construction: Install gypsum board with "floating" internal corner construction, unless isolation of the intersecting board is indicated.
6. In addition to compliance with the standards, comply with specific requirements indicated for each type of arrangement of gypsum wallboard system shown. Space fasteners in accordance with manufacturer's recommendations and complying with referenced standards.
   a. Walls and Partitions: Apply sheets horizontally or vertically. Provide maximum sheet lengths to minimize end joints with edges or ends over supports. In two layer applications, stagger joints of second layer from joints of first layer.
   b. Cut and install panels to eliminate vertical joints in corners of door frames to ceiling.
   c. Make cutouts to fit within wall plate, register and grille flanged. All cutouts made by knife or saw.
   d. Make angles and corners clean, true, plumb and square; walls plumb, flat and straight and ceilings flat and level.
   e. Ceilings: Apply gypsum board on ceilings, before application on walls and partitions. Install in direction and manner to minimize end joints. Stagger end joints over supports. In two layer applications, stagger joints of second layer from joints of first layer.

C. Direct-Glue Application

1. Apply gypsum vertically with closely butted joints within 10 minutes after application of mastic adhesive, sooner if recommended by manufacturer of adhesive. Apply firm hand pressure over entire board to effect a bond and to level board. Use slight sliding movement to position board. Shim drywall 1/4" off floor.
2. Apply mastic adhesive in amounts and at locations on board as recommended by adhesive manufacturer. Provide temporary fasteners or bracing as recommended until adhesive sets.

3.07 INSTALLATION OF SOUND RATED PARTITIONS

A. Provide sound-rated construction where indicated.

B. Acoustic Insulation: Install single layer of acoustic batt insulation in designated partitions after one side of gypsum board is installed, filling width and height of partition completely. Attach to gypsum board with adhesive spots to prevent subsequent displacement.

C. Extend partition stud system through acoustical ceilings to substrate. Apply gypsum board base panels full height, both sides of partition.

D. Seal partition perimeters. Provide continuous beads of acoustical sealant at juncture of both faces of runners or plates with floor and ceiling construction and wherever work abuts dissimilar materials. Seal prior to installation of sound attenuation insulation and gypsum board panels.

E. Provide continuous beads of sealant at juncture of gypsum board and abutting surface. Install gypsum board with 1/8" relief for sealant. Sealants to be contained within depth of gypsum board, not as a fillet.

F. At openings and cutouts, fill open spaces between edges of gypsum board and fixtures, cabinets, ducts, and other flush or penetrating items, with continuous bead of acoustical sealant.

G. If sound-rated partitions intersect non-sound-rated partitions, extend sound construction to completely close-off sound flanking paths through non-rated construction. Seal joints between face layers at vertical interior angles of intersecting partitions.

H. Exercise particular care at walls surrounding toilet areas and walls and ceilings surrounding mechanical spaces to provide properly constructed sound-rated gypsum board partition and ceiling systems.

I. Verify that electrical boxes are not located back-to-back; back-to back boxes to be offset at least one stud space. Do not close off non-complying conditions before notifying and receiving direction from Architect.

3.08 TRIM AND ACCESSORIES

A. Install corner beads at external corners of gypsum wallboard work. Use longest practical lengths.

B. Install edge trim wherever edge of gypsum board would be exposed or semi-exposed.

1. Provide beaded trim to receive joint compound at all gypsum wallboard work.
2. Provide L-type trim where work is abutted to other work and Kerf-type where work is kerfed to receive kerf leg.
3. Provide U-type trim where edge is exposed, revealed, gasketed or sealant filled, including expansion joints.

C. Attach to framing with screws. Clinch attachment to wallboard not acceptable.

D. Control Joints

1. Install control joints to isolate gypsum board surfaces as recommended by ASTM C840. Verify locations with Architect prior to installation. Generally locate joints as follows when:
   a. Partition, furring or column fireproofing abuts a structural element (except floor) or dissimilar wall or ceiling.
   b. Ceiling abuts a structural element, dissimilar wall or partition or other vertical penetration.
   c. Construction changes within the plane of the partition or ceiling.
   d. Partition or furring run exceeds 30'.
   e. Ceiling dimensions exceed 50' in either direction with perimeter relief; 30' without relief.
   f. Exterior ceilings and soffits exceed 20' in either direction; align with window mullions, when applicable.
   g. Wings of "L", "U", and "T"-shaped ceiling areas are joined.
   h. Expansion or control joints occur in the base exterior wall.
   i. Differential Deflection Conditions: All locations where partitions are supported by two or more structural members and subject to differential deflection by live or dead loading:
      1) Typical Framing Floor to Structure: Provide "Ceiling Deflection Track".
      2) Framing over One Floor (stairs, shafts, etc.): Provide control joints where studs are interrupted by structure.
2. Provide framing immediately on both sides of joint and back with 2"+/- gypsum board strips as required to maintain fire resistance rating.

3.09 FINISHING

A. Comply with manufacturer's instructions for mixing, handling and application of materials. Apply treatment at joints both directions, at flanges of trim accessories, penetrations of gypsum board (electrical boxes, piping and similar work), fastener heads, surface defects and elsewhere indicated. Apply in manner that will result in each of these items being concealed when applied decoration has been completed.

B. Prefill open joints of more than 1/16" with special chemical-hardening type bedding

compound, before bedding joint tape.

C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

D. Do not use topping compound for bedding joint tape.

E. Apply joint compound for the final coat of joint treatment, unless specifically recommended by the manufacturer for that use.

F. Walls Above Acoustical Ceiling Systems: Tape and fill joints with two coats of joint compound, sanding not required.

G. Leave all exposed surfaces smooth and even, ready for painting.

H. Provide where indicated on the drawings levels of finish as specified in ASTM C840, "Recommended Specification on Levels of Gypsum Board Finish". Levels of finish consist of:

1. Level 1 - **Areas Above Ceilings**: All joints and interior angles shall have tape embedded in joint compound. Provide surface free of excess joint compound. Tool marks and ridges are acceptable.
2. Level 2 – **As a Substrate for Ceramic Tile**: All joints and interior angles to have tape embedded in joint compound and one separate coat of joint compound applied over all joints, angles, fastener heads, and accessories. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
3. Level 4 – **All Areas Not Indicated to Receive Levels 1, 2 or 5**: All joints and interior angles to have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. All joint compound shall be smooth and free of tool marks and ridges.
4. Level 5 – **All Areas to Receive Semi-Gloss or Gloss Coatings**: All joints and interior angles to have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface. Excess material is to be removed leaving a film covering over the gypsum board paper surface.

3.10 ADJUST AND CLEAN

A. Remove any screw which does not engage into a framing member or spins freely.

B. When paper face is punctured, drive new screw approximately 1-1/2" from defective fastener and remove defective fastener. Fill damaged surface with compound.

C. Ridging

1. Do not repair ridging until condition has fully developed: approximately 6

months after installation or one heating season.

2. Sand ridges to reinforcing tape without cutting through tape.
3. Fill concave areas on both sides of ridge with topping compound.
4. After fill is dry, blend in topping compound over repaired area.

D. Fill cracks with compound and finish smooth and flush.

END OF SECTION

SECTION 09 30 00

TILE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Extent of tile work is shown on drawings and schedules, and as specified herein.

B. Types of tile work required including the following:

1. Ceramic wall tile, floor tile and base.
2. Backer board.

1.02 RELATED SECTIONS

A. Sealant: Section 07 92 00.

B. Concrete slab preparation: Section 01 73 00.

1.03 QUALITY ASSURANCE

A. Manufacturer: Provide tile of each type produced by a single manufacturer. Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

B. Installer: A firm with not less than 5 years experience in installing tile in applications similar to those required for this work.

C. Ceramic Tile Manufacturing Standard: TCA 137.1. Furnish tile complying with Standard Grade requirements unless indicated otherwise.

D. Proprietary Materials: Handle, store, mix and apply proprietary setting and grouting materials in compliance with manufacturer's instructions.

E. Installer to verify locations of all flexible joints required by the provisions of this section, by the recommendations of TCA, and by the recommendations of the related manufacturers. See Article 3.06.

1. Joint locations may not be indicated on the drawings.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical information and installation instructions for materials required. Include certifications and other data to show compliance with these specifications.

B. Samples: Submit manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors available, for each type of tile specified. Include samples of grout and accessories requiring color selection. Submit full size sample for each type of trim, accessory and color. Submit samples of metal edge strip.

C. Certification: Furnish Master Grade Certificate for each type of tile, signed by manufacturer and Installer.

1.05 PRODUCT HANDLING

A. Deliver packaged materials and store in original containers with seals unbroken and labels intact until time of use, in accordance with manufacturer's instructions.

1.06 JOB CONDITIONS

A. Maintain environmental conditions and protect work during and after installation in accordance with referenced standards and manufacturer's printed recommendations.

PART 2 PRODUCTS

2.01 CERAMIC TILE

A. Wall Tile, Floor Tile and Base: Cushion edge, standard grade, impervious porcelain ceramic tile conforming to ANSI 137.1. Provide trim pieces as required.

1. Walls: 6" x 6", glazed.
   a. Colors: Minimum of 2 colors per room will be used.
   b. Color Layout (Patterns): As indicated or as directed by Architect.
2. Floors: 12" x 12", unglazed. Provide abrasive grain for slip resistance.
   a. Colors: Minimum of 2 colors per room will be used.
   b. Color Layout (Patterns): As indicated or as directed by Architect.
3. Base: Provide 4" high, porcelain ceramic tile, cove base with square top, for meeting wall tile and bullnose top at terminations. Base pieces to be of length to match wall tile, or multiples of wall tile. Provide inside and outside corners and trim pieces as required.
   a. Color and finish to match wall tile as selected by Architect.
4. Manufacturer: Provide ceramic floor tile, wall tile and base as manufactured by one of the following subject to the above requirements.
   a. BUCHTAL.
   b. AMERICAN OLEAN TILE.
   c. DAL-TILE CORPORATION.
   d. MID-STATE TILE COMPANY.
   e. MONARCH TILE COMPANY.

   An unacceptable pattern or color match is reason for disapproval of product and manufacturer. No substitutions will be considered after bid opening.

2.02 MORTAR, GROUT AND ACCESSORIES

A. See Tile Installation Systems in Part 3 of this Section. Setting mortar and grout to be from same manufacturer.

B. Latex-Portland Cement Setting Mortar - Thin Set: Factory mixed mortar of Portland cement/sand, field gauged with undiluted latex admixture. Conform to ANSI A118.4, Latex-Portland Cement Mortar.

1. Provide one of the following:
   a. BOSTIK, Durabond D-50 or D-60.
   b. TEC (H.B. FULLER), Fullflex.
   c. MAPEI, Kerabond or Keralastic.
   d. LATICRETE, 255 MultiMax.

C. Dry-Set Mortar - Thin Set: Mixture of Portland cement with sand and latex, water imparting additive. Conform to ANSI A118.2, Conductive Dry-Set Portland Cement Mortar.

1. May be used in lieu of Latex-Portland Cement Setting Mortar for ceramic floor and wall tile.

D. Grout - Ceramic Tile: Integrally colored, sanded, non-staining, latex Portland cement, factory prepared (premixed) grouts gauged with undiluted latex additive. Color as selected by Architect.

1. Provide one of the following:
   a. BOSTIC, Hydroment.
   b. TEC (H.B. FULLER), AccuColor.
   c. MAPEI, Keracolor.
   d. LATICRETE, Grout.
2. Latex Additive: Liquid latex polyacrylate. Provide one of the following or equal by manufacturers listed above:
   a. MAPEI, Plastijoint
   b. TEC (H.B. FULLER), Grout Additive #TA869
   c. Similar types by BOSTIC or LATICRETE.

E. Membrane Waterproofing: Provide one of the following:

1. One component trowel applied elastomeric waterproofing membrane. Manufacturer's published literature must include statement that material allows for substrate movement of up to L/240. Hydroment Ultra-Set by BOSTIC or equal product by NATIONAL APPLIED CONSTRUCTION PRODUCTS, INC., TEC (H.B. FULLER) or CUSTOM BUILDING PRODUCTS that meet the specified requirements.
   a. Provide mat or tape accessories as recommended by waterproofing manufacturer to treat slab cracks and expansion joints.
2. Double coat, trowel applied, two-component material with 6 ounce fiber mesh reinforcing and sheet membrane for detail work at transitions in plane. Sheet membrane to be recommended and approved by waterproofing manufacturer for use in their system. Planicrete W Heavy-

Duty Double Coat System by MAPEI or equal products by CUSTOM BUILDING PRODUCTS, TEC (H.B. FULLER) or LATICRETE INTERNATIONAL INC.

F. Crack Isolation

1. Description: Minimum 40 mil, self-adhering membrane.
2. Manufacturer: 9235 Anti-Fracture Membrane by LATICRETE; ECB Antifracture Membrane by NAC PRODUCTS Composeal Gold by COMPOTITE CORPORATION; Nobleseal CIS by THE NOBLE COMPANY, TA139 Anti-Fracture Membrane by TEC (H.B. FULLER).

G. Metal Edge Trim: Provide type and depth trim as indicated. Provide in locations indicated. Also provide at control joints, between floor tile and dissimilar material and where thresholds do not occur. Except as otherwise indicated, where trim is located across door openings, locate trim on the door side in line with the edge of the door stop, terminating at the rabbet. Provide stainless steel products.

1. Manufacturer: SCHLUTER, CERAMIC TOOL COMPANY, BLANKE. Styles as indicated or required by substrate conditions.

2.03 TILE BACKER BOARD

A. Description: Nominal 1/2" thick cementitious board with fiberglass mesh reinforcements conforming to the requirements of ANSI A118.9..

1. Provide cadmium plated screws, type as recommended by board manufacturer.
2. Joint Treatment Tape: 2" wide, 10x10 glass mesh type or similar type as recommended by board manufacturer.

B. Manufacturer: Wonder Board by MODULARS, INC.; Util-A-Crete by FIN PAN; Durock Interior Tile Backer Board by U.S. GYPSUM; Dens-Shield by GEORGIA PACIFIC.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine surfaces to receive tile, setting beds and accessories before tile installation for the following:

1. Defects or conditions adversely affecting quality and execution of the installation.
2. Deviations beyond allowable tolerances of surfaces to receive tile.
3. Do not proceed with installation work until unsatisfactory conditions are corrected.

B. Conditions of surfaces to receive tile.

1. Surfaces to be firm, dry, clean, and free of oily or waxy films or curing compounds.
2. Grounds, anchors, plugs, hangers, bucks, electrical, plumbing and HVAC work in or behind tile to be installed prior to proceeding with tile work.

3.02 PREPARATION

A. Prepare surfaces to receive tile as required to achieve proper bond and as recommended by the Tile Council of America.

1. See Section 01 73 00 for additional floor preparation requirements.

B. Fill cracks, low areas and pits in concrete with self-leveling fill of type recommended by tile manufacturer for substrate conditions encountered.

C. When required, lightly grind concrete subfloors with a terrazzo grinder to remove trowel marks or other surface irregularities which will telegraph to the flooring surface.

D. Sawcut or grind transition areas as required to install tile as indicated.

E. Clean surfaces in a manner suitable for proper installation. Verify that slabs are free of curing membranes, oil, grease, wax, dust and other materials deleterious to tile installation.

F. Primers or other preparations required or recommended in accordance with manufacturer's instructions.

3.03 TILE BACKERBOARD

A. Location: Provide tile backerboard on metal stud walls as a substrate for ceramic tile products specified herein which are located on toilet room wet walls and other areas where indicated.

B. Install in strict accordance with manufacturer's recommendations and ANSI A108.11, Interior Installation of Cementitious Backer Units.

1. Butt ends and edges of adjacent panels.
2. Attach with screws spaced at 6 inch centers on perimeter and field.
   a. Maintain minimum 1/2 inch from screws to panel edge.
   b. At wainscot or similar location where tile terminates in same plane of wall, shim tile backerboard flush with adjacent wall board. Provide shims continuous along face of studs.
3. Locate control and expansion joints in same locations as substrate and where required by wall tile.
4. Apply glass mesh tape, or type recommended by board manufacturer, over joints. Embed tape in setting material indicated for specified tile finish.

3.04 WALL TILE INSTALLATION - SYSTEMS

A. Prepare surfaces, fit, set or bond, grout, and clean in accordance with Tile Council of America, "Handbook for Ceramic Tile Installation", 2008 Edition; and as follows:

B. Interior Stud Walls - Over Tile Backerboard: TCA W244, dry-set mortar bond coat or latex Portland cement bond coat and grout.

1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.
3. Backerboard
   a. Joint Preparation: Fill joints completely with setting mortar and embed 2 inch wide coated fiberglass tape into skim coat of same mortar.
   b. Apply setting mortar in one layer, troweling skim coat with trowel's flat edge and then texturing with appropriate notched trowel. Troweling equipment must be appropriate for type of tile work and in good condition.

C. Interior Stud Walls - Over Gypsum Board: TCA W243, dry-set mortar bond coat or latex Portland cement bond coat and grout.

1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.

3.05 FLOOR TILE INSTALLATION - SYSTEMS

A. Prepare surfaces, fit, set or bond, grout, and clean in accordance with Tile Council of America, "Handbook for Ceramic Tile Installation", 2008 Edition; and as follows:

B. Interior Floor - Thin Set, Waterproof Membrane: TCA Design F122, waterproofing, latex Portland cement bond coat and grout.

1. Install in strict conformance with waterproofing membrane manufacturer's written instructions and recommendations.
2. Tile: ANSI A108.5.
3. Grout: ANSI A108.10.

C. Interior Floor - Thin Set, Without Waterproof Membrane: TCA design F113, latex Portland cement mortar and grout or dry-set mortar and grout.

1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.

3.06 TILE INSTALLATION - PROCEDURES

A. Anti-Fracture Membrane: Install over floor cracks. Discontinue at control and expansion joints. Install in compliance with manufacturer’s instructions and shop drawings. Seam joints as recommended by manufacturer.

B. Extend tile work into recesses and under or behind equipment and fixtures, to form

a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars or covers overlap tile.

D. Placement Methods: Install tile using the hereinbefore specified setting beds and grouts.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting.

1. Avoid tile layout with less than half width tiles at room/area perimeters, unless otherwise indicated on the floor layout drawings. Notify Construction Manager if layout not achievable per layout indicated on the drawings. Do not continue in room/area in question until approved by the Associate.
2. Provide uniform joint widths, unless otherwise shown.
   a. Provide 1/4” joints for large format ceramic tile.

3.06 FLEXIBLE JOINTS

A. Locate flexible joints (expansion, control and isolation joints) prior to tile installation. See Quality Assurance in Part 1 herein.

B. Provide flexible joints as specified herein, unless more stringent requirements are indicated on drawings. Provide as specified, regardless if not indicated on drawings.

C. Joint to be continuous from face of tile to bottom of setting bed or leveling bed. Reinforcing to be discontinued at joint. Install continuous joint filler material in joint from setting or leveling bed to a point below face of tile adequate for proper placement of backing rod and sealant.

D. Joint Design: TCA design EJ171 as applicable. See Section 07 92 00 for sealant. Provide at the following locations:

1. Horizontal Surfaces
   a. Directly over joints in structural floor, including cold joints, construction joints, control joints, and expansion joints.
   b. Where tile work abuts restraining surfaces such as perimeter walls, curbs, columns, pipes, etc.
   c. Floor areas exceeding 24 feet in any direction.
   d. Where indicated.
2. Vertical Surfaces

a. Directly over joints in wall substrate including cold joints, construction joints, control joints and expansion joints.
b. At changes in substrate material.
c. Where tile work abuts restraining surfaces such as perimeter walls, curbs, columns, pipes, etc.
d. Where indicated.

E. Curing: Cure tile floor, base, and wall installations in accordance with manufacturer's recommendations, TCA recommendations, and in accordance with ANSI requirements.

F. Metal Edge Strips: Provide metal edge strips at openings without thresholds, and where exposed edges of tile floors meet other materials.

3.07 REPAIR, CLEAN AND PROTECT

A. Repair, or remove and replace chipped, damaged or otherwise defective work to the satisfaction of the Architect.

B. Cleaning: Upon completion of placement and grouting, clean all tile surfaces so that they are free of foreign matter.

1. Use methods and materials as recommended by tile manufacturer.
2. Replace tiles that cannot be satisfactorily cleaned.

C. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent damage and wear.

1. Prohibit foot and wheel traffic from using tiled floors for at least 3 days after grouting is completed.
2. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide acoustical lay-in panel ceiling system as shown and specified.

1.02 RELATED SECTIONS

A. Gypsum Board Ceiling: Section 09 21 16.

1.03 QUALITY ASSURANCE

A. Workmanship: Comply with Ceilings & Interior Systems Contractors Association (CISCA) Code of Practices.

B. Installation: Performed by an experienced authorized installer approved by acoustical material manufacturer.

C. Fire Hazard Classification: Provide acoustical materials which have been UL tested, listed and labeled Class 0-25, when tested in accordance with ASTM E84, Class A flame spread rating in accordance with ASTM E1264 requirements.

D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standards.

1. AIMA: Acoustical and Insulating Materials Association.
2. ASTM: American Society for Testing and Materials.
3. CISCA: Ceilings and Interior Systems Contractors Association.

E. Coordination Between Trades: Quality assurance includes the cooperation with HVAC, Plumbing and Electrical Contractors in regards to ceiling grid layout.

1. Procedures for submitting coordination drawings for ceiling work is included in Section 01 33 23 - Shop Drawings, Product Data and Samples.

1.04 SUBMITTALS

A. Product Data

1. Submit manufacturer's product data and installation instructions for each type of acoustical material and suspension system required.

2. Submit manufacturer's written instructions for recommended maintenance practices for each type of acoustical ceiling system required. Include

recommendations for cleaning and refinishing acoustical units and precautions against materials and methods that may be detrimental to finishes and acoustical performances.

B. Samples: Submit 12" square acoustical panel samples for each type of acoustical unit required. Provide 12" long suspension system and edge molding samples.

C. Certification: Submit manufacturer's certification of acoustical units fire hazard classification rating and performance requirements.

D. Maintenance Materials: Provide 2% each type and color of acoustical material supplied for replacement and maintenance purposes. Provide full size units, matching units installed, in properly labeled unopened or resealed boxes.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unopened protective packaging, with manufacturer's labels indicating brand name, pattern size, thickness and fire rating as applicable, legible and intact.

B. Store materials in original protective packaging to prevent soiling, physical damage or wetting.

C. Store cartons open at each end to stabilize moisture content and temperature.

D. Do not begin installation until sufficient materials to complete a room are received.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Pressurized Plenums (to comply with CISCA's recommendations for cleaning duct system and protecting ceiling units in pressurized plenums from damage and soiling caused by blowing dirt and dust that may be present when duct system is first operated): Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 PRODUCTS

2.01 SUSPENSION SYSTEM

A. Exposed "Tee" Grid System

1. Description: Cold-rolled electrogalvanized steel, factory applied white finish. SA-1: 15/16” exposed face; DONN (USG INTERIORS) Model DX; CHICAGO METALLIC 200 Snap Grid System; ARMSTRONG Prelude.

2. Description: Comply with ASTM C635. Provide systems adequate to support light fixtures, ceiling diffusers, and other normal accessories. Maximum deflection 1/360 of the span. All components of system from one manufacturer, die cut, and interlocking.
   a. Structural Class: Intermediate duty.
   b. Type of System: Direct Hung.
   c. Attachment Devices: Size for five times design load indicated in ASTM C635, Table 1 direct hung.
   d. Hanger Wires: ASTM A641 galvanized carbon steel, soft temper, prestretched not less than 12 gauge.
   e. Carrying Channels: 1-1/2" steel channels, hot-rolled or cold-rolled, not less than 0.475 lbs per linear foot, standard finish.
   f. Members: Provide manufacturer's standard exposed runners, cross runners and accessories of type and profiles indicated, with exposed cross runners coped to lay flush with main runners.
   g. Hold Down Clips: Manufacturer's standard; provide in areas not scheduled to receive retention clips.
   h. Retention Clips at Impact Resistant Ceiling: Manufacturer's standard retention clips designed and spaced to secure acoustical tiles in-place against vandalism in public areas.
3. Edge Moldings: Hemmed edge wall angles, cold-rolled electrogalvanized steel, factory applied finish to match grid system.

2.02 ACOUSTICAL UNITS

A. Acceptable Manufacturers: The following models listed are by ARMSTRONG. Equal products by CELOTEX or U.S. GYPSUM are acceptable.

B. Panel Types: Type SA-1: Cortega #769, 24” x 48”, square edge for 15/16” grid, NRC range .55, CAC 35, light reflectance LR-.82, with white.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, structure and installation conditions. Do not proceed with acoustical ceiling systems work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half widths units at borders.

B. Coordinate with ceiling layout on drawings.

C. Notify Architect of discrepancies between ceiling layout on drawings and ceiling layout proposed. Do not proceed until approved by Architect.

3.03 INSTALLATION

A. Suspension System: Comply with ASTM C636 requirements and be water or laser leveled, maximum deflection of 1/360 of span and maximum surface leveling tolerance 1/8" in 12'-0".

B. Rough Suspension

1. Hangers: Ceiling suspension systems shall not be supported from ductwork, electrical conduit, heating or plumbing lines or any other utility lines. Each utility and the ceiling suspension system shall be a separate installation and each shall be independently supported from the building structure. Where interferences occur, employ trapeze hangers or supports to avoid interferences with appurtenances requiring servicing. Support all four corners of suspension systems at fluorescent light fixtures.
2. Wall Molding
   a. Provide edge trim molding at perimeter of acoustical ceiling installation and intermediate vertical surfaces. Use maximum lengths. Miter trim corners to provide tight, accurate joint. Connect moldings securely to substrate surfaces.
   b. Connect moldings to substrate at intervals not over 16" on center and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0".
3. Hold-Down Clips: Provide on all panels adjacent to light fixtures.
[4. Retention Clips: Provide on all tiles in areas listed herein.]

C. Acoustical Units

1. Install acoustical lay-in panels level, in uniform plane, with joints snug and square and panels free from damage or soiling.
   a. Fit border units accurately at borders and penetrations.
   b. Recreate tegular and decorative edges at wall cuts and other cuts.
2. Coordinate suspension systems grid layout with electrical lighting fixture lay-out and installation.

3.04 CLEANING

A. After installation, clean soiled or discolored surfaces of acoustical units and exposed suspension members. Comply with manufacturer's recommendations for cleaning and touch-up of minor finish damage.

B. Adjust all sags and twists which develop in ceiling systems. Remove and replace units which are improperly installed and damaged units which cannot be successfully cleaned and repaired to eliminate evidence of damage.

END OF SECTION

SECTION 09 65 00

RESILIENT FLOORING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide resilient flooring as shown and specified. Work includes:

1. Vinyl composition tile flooring.
2. Base.
3. Adhesives and accessories to complete the work.

1.02 RELATED SECTIONS

A. Concrete slab preparation: Section 01 73 00.

1.03 QUALITY ASSURANCE

A. Provide each type of resilient flooring and base material produced by one manufacturer, including recommended adhesives and leveling compounds.

B. Provide each type resilient flooring and base material from same production run. Colors shall be uniform throughout.

C. Fire Test Performance: Provide materials complying with referenced standard fire tests.

1. ASTM E84 (Tunnel Test): Flame spread less than 75 (Class B).
2. ASTM E162: Flame spread less than 75 (Class B).
3. U.L. 992: Flame propagation index less than 2.0.

D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

1. ASTM: American Society for Testing and Materials.
2. FS: Federal Specifications as established by the U.S. Government, General Services Administration.
3. U.L.: Underwriter's Laboratories.
4. ADA: Americans with Disabilities Act Accessibility Guidelines.

E. Slip Retardant Performance: Unless a greater performance is specified under a specific product, all floor materials must have a minimum static coefficient of friction of 0.6.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of

resilient flooring, base and accessory required.

B. Samples

1. Tiles: Submit full sized samples of each type, color and pattern required to illustrate the full range of color variations.
2. Base: Provide 6" lengths of each type and color.

C. Submit manufacturer's certification that resilient flooring furnished complies with required fire test performance and has been tested and meets indicated requirements.

D. Submit manufacturer's written instructions for recommended maintenance practices for each type of resilient flooring, base and accessory material required.

E. Extra Stock: Furnish extra materials in the following quantities:

1. Tiles and Base: Furnish 2% of the total quantity (but not less than 2 full sealed cartons) of each type, pattern and color. Provide 5% of colors with less than 5000 square feet. Properly package and identify each material.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened labeled containers.

B. Store, protect, and handle resilient flooring materials in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration.

C. Store materials in areas to receive resilient flooring for a minimum of 48 hours before installation.

1.06 PROJECT CONDITIONS

A. Maintain uniform room temperature range not less than 70 degrees F., in areas to receive resilient flooring for minimum 48 hours before installation and 48 hours after installation.

B. Provide adequate lighting and ventilation during installation and clean-up.

C. Protect adjoining surfaces from damage and soiling.

PART 2 PRODUCTS

2.01 RESILIENT FLOORING MATERIALS

A. Vinyl Composition Tile: ASTM F1066, Class 1 or 2 as applicable, 12" x 12" x 1/8", manufactured without asbestos.

1. Colors, Patterns and Manufacturers

a. Basis of Design: Colors and types indicated on the drawings are based on ARMSTRONG.
b. Other Acceptable Manufacturers: Products manufactured by MANNINGTON or TARKETT are acceptable providing they meet the requirements specified herein and are an acceptable color match as approved by the Architect. Color match should be submitted to the Architect during bidding for inclusion by an Addendum.

B. Vinyl Base – Standard Type: Complying with ASTM F1861, Type TV, Group 2, 6" high, 1/8" gage. Provide long length rolls and job formed corners. Standard top set cove (Style B) at resilient and other hard surface flooring and straight toeless (Style A) at all carpeted floors. Base shall contain a minimum of 90 percent recycled material.

1. Colors and Manufacturers
a. Basis of Design: Colors and types indicated on the drawings are manufactured by JOHNSONITE.
b. Other Acceptable Manufacturers: Products manufactured by VINYL PLASTIC, INC. (VPI) or ROPPE are acceptable providing they meet the requirements specified herein and are an acceptable color match as approved by the Architect. Color match should be submitted to the Architect during bidding for inclusion by an Addendum.

2.02 ACCESSORIES

A. Concrete Slab Prime: Non-staining type, compatible with adhesive, as recommended by flooring manufacturer.

1. Moisture Emissions Sealer: Epoxy type similar to CHEMREX CX Concrete Floor Primer, SINAK Sealer P-105 or equal type specifically formulated for moisture emission control.

B. Leveling Compound: Non-staining latex modified, Portland cement based type, compatible with flooring, as provided or recommended by the flooring manufacturer.

C. Adhesives: Waterproof, stabilized type as recommended by the resilient flooring and base manufacturer to suit material and substrate conditions.

D. Resilient Edge Strips: 1/8" thick homogeneous vinyl or rubber composition, tapered or bullnose edge, color to match flooring, or as selected by Architect from standard colors; not less than 1" wide.

E. Cleaning and Polishing Materials: Polish and neutral cleaner as recommended by the floor material manufacturer.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates and installation condition. Do not proceed with resilient flooring work until unsatisfactory conditions have been corrected.

B. Subfloor surfaces shall be smooth, level, at the required finish elevation, and within the tolerances specified in Section 03 30 00.

C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Before installing flooring, vacuum clean substrate surfaces and inspect subfloor to verify that concrete slab complies with ASTM F710.

1. When required, lightly grind concrete subfloors with a terrazzo grinder to remove trowel marks or other surface irregularities that will telegraph to the flooring surface.
2. Fill cracks, low areas and pits in concrete with self-leveling fill of type recommended by flooring manufacturer for substrate conditions encountered.
3. Perform bond, alkalinity and moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured and are ready to receive flooring.
4. Moisture Testing
   a. Perform anhydrous calcium chloride test, ASTM F1869. Proceed with installation only after substrates have a maximum moisture vapor emission rate of 3 lbs. of water/1000 sq. ft. in 24 hours.
   b. Proceed with installation only after substrates pass testing.
   c. If after 120 days of slab placement moisture levels are not within the specified limits, apply floor primer as specified below.
5. Apply primer, if moisture emissions are greater than the specified amount or for other purposes as recommended by flooring manufacturer, before application of adhesive. Apply in compliance within manufacturer's recommended limits.

3.03 INSTALLATION

A. Install resilient flooring and accessories with adhesive in strict compliance with the manufacturer's recommendations. Butt tightly to vertical surfaces, thresholds, nosings and edgings. Scribe around obstructions and to produce neat joints, laid tight, even and straight. Extend flooring into toe spaces, door reveals and into closets and similar openings.

B. Tile Flooring

1. Lay tile flooring with joints tight, in true alignment and parallel to walls of rooms and corridors.
2. Lay tile symmetrically about centerlines of space, without pattern or

borders. Adjust layout to avoid use of cut widths less than one-half tile at room perimeter.

3. Match tile for color by using manufactured and packaged sequence.
4. Broken, cracked, or deformed tiles are not acceptable.
5. Immediately after installation, thoroughly roll tile with a 150 lb. sectional roller until a firm, uniform bond has been obtained.

C. Static Dissipative Tile Flooring: In addition to the above requirements, conform to ARMSTRONG Installation System Manual F-5061 or similar type recommended system by other approved manufacturer.

D. Base

1. Install at walls, column, casework and other permanent fixtures as scheduled. Install in as long of lengths as practicable. Tightly bond base to backing throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
2. Provide terminal base ends beveled and toes rounded.
3. On masonry surfaces or other similar irregular surface, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

E. Edge Strips: Place tightly butted to flooring and secure with adhesive. Install at edges of flooring which would otherwise be exposed.

3.04 CLEANING AND PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. After flooring has set, clean thoroughly. Remove excess adhesive or other surface blemishes from flooring, using neutral type cleaners as recommended by the flooring manufacturer.

C. Perform initial maintenance according to latest edition of manufacturer's maintenance manual and the following:

1. Vinyl composition Tile: Clean, apply polish, and buff with type of polish, number of coats and buffing procedures in accordance with manufacturer's instructions.

D. Protect installed flooring from damage and staining with heavy duty non-staining Kraft paper or other covering at all traffic lanes. Protect completed work from traffic and damage until final acceptance.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.01 SCOPE

A. Work Included

1. Surface preparation and painting or finishing of all interior and exterior exposed items and surfaces except as otherwise indicated. Work includes, but is not necessarily limited to, the following:
   a. Walls, ceilings and soffits of gypsum board.
   b. Concrete surfaces where indicated.
   c. Hollow metal doors and frames.
   d. Wood doors, frames, trim, casework and millwork as required.
   e. Exposed structure including deck and all framing.
   f. Exposed ferrous metal of any type, interior and exterior, including galvanized items.
   g. Exposed sheet metal, ductwork, conduit and piping in finished areas; not mechanical equipment or electrical equipment rooms.
   h. Exposed prime coated or unfinished mechanical or electrical items outside of mechanical equipment rooms. Repaint factory finished mechanical or electrical items where specified.
   i. Stenciling of fire walls above ceilings.
   j. Other items noted or specified.
2. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under other sections of the work.

B. Mechanical Equipment Rooms: Painting subject to the following requirements:

1. Paint finish on walls and ceiling, when scheduled on drawings, to be applied prior to installation of mechanical/electrical work as much as possible.
2. Spray painting not permitted after electric motors have been installed.

C. Work Excluded: Do not paint the following items unless specifically called for to be painted herein or where idicated on the drawings.

1. Prefinished items include the following factory-finished components:
   a. Architectural woodwork.
   b. Acoustical wall panels.
   c. Toilet enclosures.
   d. Finished mechanical and electrical equipment.
   e. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    a. Foundation spaces.
    b. Furred areas.
    c. Ceiling plenums.
    d. Pipe spaces.
    e. Duct shafts.
3. Finished metal surfaces include the following:
    a. Anodized aluminum.
    b. Stainless steel.
    c. Chromium plate.
    d. Copper and copper alloys.
    e. Bronze and brass.
4. Operating parts include moving parts of operating equipment and the following:
    a. Valve and damper operators.
    b. Linkages.
    c. Sensing devices.
    d. Motor and fan shafts.
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Surface Preparation

1. It is the intention of this specification that new substrates will be ready for decoration as specified herein except for normal construction dust and soiling.
2. Surfaces installed by other trades are required to be acceptable for work specified under Part 3, Surface Preparation. Specifically, surfaces to be clean, sound, free from loose particles, dirt, loose mortar and grease.

1.02 RELATED SECTIONS

A. Metal Building Finish requirements: Section 13 34 19.

1.03 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions; including rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures; includes installations within unheated shelters.

1.04 QUALITY ASSURANCE

A. Application: Performed only by skilled, experienced painters.

B. Provide lead free prime and finish coatings. All top coatings shall be mold and mildew resistant.

C. Coordination: Provide finish coats compatible with prime paints used. Review other specification sections to ensure compatibility of total coating system with prime paints provided for the various substrates. Provide barrier coats over non-compatible primers or remove primer and reprime as required. Notify the Architect of anticipated problems using coating systems specified on substrates primed in accordance with other section requirements.

D. Reference Specifications

1. The following Society for Protective Coatings (SSPC) specifications are referenced by code number within this Section.

Code	Method
SP-1	Solvent Cleaning
SP-2	Hand Tool Cleaning
SP-3	Power Tool Cleaning
SP-6	Commercial Blast Cleaning
SP-11	Power Tool Cleaning to Bare Metal

E. Job Mock-Ups: Provide only if required by the Owner. Mock-ups will serve as standard for acceptance of work. Leave approved mock-ups in place as part of completed project. Manufacturers' representatives shall be available to advise applicator on proper application techniques and procedures. Locate as directed.

F. Paint walls prior to installing wall mounted signage.

1.05 SUBMITTALS

A. Submit a complete selection of manufacturer's color chips indicating color, texture and sheen for approval for each finish specified herein.

B. Submit a complete schedule for identifying manufacturer and specific brand name or number of products proposed for finishing specified surfaces.
1. Provide percent of solids by volume content data for each paint material.
2. Provide paint label analysis and application instructions for each type paint.

C. Provide the following quantities of paint of each type and color required for maintenance purposes. Provide original, unopened, labeled containers with color samples and a list of project use. Extra materials are not to be used for touch-up by Contractor.

1. Metals and Wood: 2 gallons.
2. Gypsum Board: 5 gallons.

D. Color/Finish Samples

1. After receiving color chips from the Contractor, the Architect will provide a complete schedule of colors and sheens desired.
2. Obtain schedule well in advance of commencing work and submit samples of specified finishes for approval.
3. Submit duplicate samples on the same kind of materials to which finishes will be applied. One half of the sample shall show the completed treatment and the other half shall show the successive steps, taken in producing the finish. When approved, samples will be so marked; one set will be retained by the Architect and one set will be returned for the painter's use.
4. No finishes shall be applied on the work until samples are approved. Approved samples shall be strictly duplicated in the work. Additional coatings, if required to reproduce approved samples, shall be applied without additional cost to the Owner.
5. Use representative colors when preparing samples for Architect's review.

E. Statement From Manufacturer

1. Contractor, in submitting the list of proposed subcontractors, shall include for approval, along with the name of the painting subcontractor, the names of the manufacturers whose materials the subcontractor proposes to use in the work.
2. Following tentative approval of the subcontractor and the materials manufacturers, notify the manufacturers, in writing, that the specifications require the manufacturers to submit to the Architect, a statement by a corporate officer of the manufacturer that coatings scheduled by the Architect are proper for the intended use and that the manufacturer's representative will be available to advise the Architect and the Contractor regarding applications of all coatings.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials on the job site in original, new, unopened packages and containers bearing the manufacturer's name, label and the following information:
1. Name or title of material.
2. Manufacturer's stock number and date of manufacture.
3. Manufacturer's name.
4. Contents by volume, for major pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.

B. Store, protect and handle materials in accordance with manufacturer's recommendations to prevent damage and deterioration. Store paint materials at minimum of 50° F.

C. Maintain paint material storage space as clean, non-hazardous and orderly. Place waste and soiled paint rags in tightly covered metal containers; safely dispose of at end of each working day. Take every precaution to avoid fire hazards and spontaneous combustion. Provide acceptable type of fire extinguisher immediately adjacent to paint storage area.

1.07 PROJECT CONDITIONS

A. Coordinate painting and finishing work with other trades to ensure adequate illumination, ventilation and dust-free environment during application and drying of paint and finish treatments.

B. Maintain uniform interior building temperature of minimum 50° F for 24 hours before, during and continuously for 48 hours after painting.

C. Do not apply coatings when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Provide adequate ventilation as required for specified paint and finish treatment materials in spaces scheduled. Maintain for time periods recommended by material manufacturer to provide proper drying.

E. Provide adequate illumination on surfaces to be finished. Maintain a minimum 80 foot candle lighting level measured mid-height at substrate surface.

F. Protect adjoining surfaces against damage or soiling.

G. Maintain work in neat and orderly condition, promptly removing empty containers, wrappings, soiled rags, waste and rubbish from site.

H. Material Safety Data Sheets (MSDS): Provide documents available to Owner's Representative, Architect and construction personnel at the job site. Comply with MSDS requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Paint: Brands of paint and stain are specified only to establish a standard of quality and color (where applicable). Other paint brands and manufacturers such as BENJAMIN MOORE; ICI (DEVOE; GLIDDEN); MARTIN SENOUR; PPG; PRATT AND LAMBERT; PORTER; CORONADO PAINT COMPANY, SHERWIN WILLIAMS are acceptable upon proof of satisfactory experience records for the intended use.

2.02 MATERIAL QUALITY

A. Provide the best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying the manufacturer's identification as standard, best-grade product will not be acceptable.

B Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only to recommended limits.

C. Provide paints of durable and washable quality. Use paint materials that will withstand normal washing as required to remove pencil marks, ink, ordinary soil, etc., without showing discoloration, loss of gloss, staining or other damage.

D. Stains: Factory-mixed, penetrating, transparent oil-base type. Applicator shall be allowed to add approved colorants on the job to match approved samples. No other ingredients shall be added to stains.

2.03 ACCESSORY MATERIAL

A. Application Equipment: Not required to be new, but shall be adequate for the work and workmanship required herein.

B. Accessories: Provide all required ladders, scaffolding, drop cloths, masking, scrapers, tools, dusters and cleaning solvents as required to perform the work and achieve the results specified herein.

C. Secondary products not specified by name (i.e. turpentine, thinners, mineral spirits, fillers, linseed oils, etc.) shall be "best grade" or "first line" products.

1. Filler material shall be woodworker's option of material that can be tinted and worked so as to match adjacent wood surfaces.

2.04 EXTERIOR PAINT AND FINISH MATERIAL SCHEDULE

A. Apply paint and finish materials to substrate surfaces indicated. Apply touch-up prime coats in addition to shop-applied prime coats. Provide additional job site prime coats when indicated.

B. Metal – Ferrous: Galvanized and Shop Primed

1. SW
   a. Finish: S-W Metalatex Semi-Gloss Enamel B42 Series. Two (2) coats at minimum 2.0 mil dft per coat. 34% to 38% solids; VOC 125 g/L
2. PPG
   a. Primer: Pitt-Tech Interior/Exterior Primer DTM Industrial Enamel 90-712 Series. One (1) coat at minimum 2.0 mils dft. 37% to 41% solids; VOC 116 g/L.

b. Finish: Interior/Exterior Semi-Gloss Acrylic Metal Finish 7-374 Series. Two (2) coats at minimum 1.5 mils dft. 32% to 36% solids; VOC 77 g/L.

3. ICI DULUX
   a. Primer: Ultra-Hide Aquacrylic Gripper #3210 Series; One (1) coat at minimum 2.0 mils dft. 49% to 51% solids; VOC 95 g/L.
   b. Finish: Ultra-HideDurus Exterior Acrylic Semi-Gloss #2416 Series; Two (2) coats at minimum 1.5 mils dft. 40% to 42% solids; VOC 79 g/L.

C. Metal – Ferrous: Unprimed

1. SW
   a. Primer: DTM Acrylic Primer B66W1. One (1) coat at minimum 2.5 mil dft. 44% to 48% solids; VOC 138 g/L.
   b. Finish: S-W Metalatex Semi-Gloss Enamel B42 Series. Two (2) coats at minimum 2.0 mil dft per coat. 34% to 38% solids; VOC 125 g/L
2. PPG
   a. Primer: Pitt-Tech Interior/Exterior Primer DTM Industrial Enamel 90-712 Series. One (1) coat at minimum 2.0 mils dft. 37% to 41% solids; VOC 116 g/L.
   b. Finish: Interior/Exterior Semi-Gloss Acrylic Metal Finish 7-374 Series. Two (2) coats at minimum 1.5 mils dft. 32% to 36% solids; VOC 77 g/L.
3. ICI DULUX
   a. Primer: Devflex 4020 Direct to Metal Primer; One (1) coat at minimum 2.2 mils dft. 43% to 45% solids; VOC 91 g/L.
   b. Finish: Ultra-HideDurus Exterior Acrylic Semi-Gloss #2416 Series; Two (2) coats at minimum 1.5 mils dft. 40% to 42% solids; VOC 79 g/L.

2.05 INTERIOR PAINT AND FINISH MATERIALS SCHEDULE

A. Apply paint and finish materials to substrate surfaces indicated. Apply touch-up prime coats in addition to shop-applied prime coats. Provide additional job site prime coats when indicated.

B. Metal – Ferrous: Shop Primed/Unprimed

1. SW
   a. Primer: DTM Acrylic Primer B66W1. 2.5 mils dft. 46% solids; 138 g/L.
   b. Finish: Harmony Low Odor Interior Latex Semi-Gloss B10 Series. Two (2) coats at minimum 1.6 mil dft per coat. 38% to 42% volume solids; VOC 0 g/L.
2. PPG
   a. Primer: Pitt-Tech Interior/Exterior Primer DTM Industrial Enamel 90-712 Series. One (1) coat at minimum 2.0 mils dft. 37% to 41% solids; VOC 116 g/L.

b. Finish: Pure Performance Interior Semi-Gloss Latex 9-500 Series. Two (2) coats at minimum 1.3 mil dft per coat. 35% to 39% volume solids; VOC 0 g/L.

3. ICI DULUX
   a. Primer: Devflex 4020. One (1) coat at minimum 2.2 mil dft. 42% to 45% solids; VOC 91 g/L.
   b. Finish: 1406 Lifemaster Semi-gloss 2000 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
4. Surfaces: Hollow metal doors, frames, door mullions, railings, ferrous metal surfaces.

C. Metal – Ferrous: Galvanized

1. SW
   a. Primer: DTM Acrylic Primer B66W1. 2.5 mils dft. 46% solids; 138 g/L.
   b. Finish: Harmony Low Odor Interior Latex Semi-Gloss B10 Series. Two (2) coats at minimum 1.6 mil dft per coat. 38% to 42% volume solids; VOC 0 g/L.
2. PPG
   a. Primer: Pitt-Tech Interior/Exterior Primer DTM Industrial Enamel 90-712 Series. One (1) coat at minimum 2.0 mils dft. 37% to 41% solids; VOC 116 g/L.
   b. Finish: Pure Performance Interior Semi-Gloss Latex 9-500 Series. Two (2) coats at minimum 1.3 mil dft per coat. 35% to 39% volume solids; VOC 0 g/L.
3. ICI DULUX
   a. Primer: Ultra Hide Aquacrylic Gripper 3210. One (1) coat at minimum 1.4 mil dft. 49% to 51% solids; VOC 95 g/L.
   b. Finish: 1406 Lifemaster Semi-gloss 2000 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
4. Surfaces: Hollow metal doors, frames, door mullions, railings, ferrous metal surfaces.

D. Gypsum Board and Plaster– Ceilings/Soffits

1. SW
   a. Primer: Harmony Low Odor Interior Latex Primer B11W900. One (1) coat at 1.3 mils dft. 31% to 35% volume solids; VOC 0g/L.
   b. Finish: Harmony Low Odor Interior Latex Flat B5 Series. Two (2) coats at minimum 1.7 mil dft per coat. 40% to 44% volume solids; VOC 0 g/L.
2. PPG
   a. Primer: Pure Performance Interior Latex Primer 9-900 Series. One (1) coat at 1.4 mil dft. 34% to 38% solids; VOC 0 g/L.
   b. Finish: Pure Performance Interior Flat Latex 9-100 Series. Two (2) coats at minimum 1.6 mil dft per coat. 38% to 42% volume solids; VOC 0 g/L.

3. ICI DULUX
   a. Primer: 1080 Lifemaster 2000. One (1) coat at 1.4 mil dft. 34% to 38% solids; VOC 0 g/L.
   b. Finish: 1402 Lifemaster Flat 2000 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
4. Surfaces: Ceilings, bulkheads

E. Gypsum Board - Walls

1. SW
   a. Primer: Harmony Low Odor Interior Latex Primer B11W900. One (1) coat at 1.3 mils dft. 31% to 35% volume solids; VOC 0 g/L.
   b. Finish: Harmony Low Odor Interior Latex Eg-Shell B9 Series. Two (2) coats at minimum 1.6 mil dft per coat. 37% to 41% volume solids; VOC 0 g/L.
2. PPG
   a. Primer: Pure Performance Interior Latex Primer 9-900 Series. One (1) coat at 1.4 mil dft. 34% to 38% solids; VOC 0 g/L.
   b. Finish: Pure Performance Interior Eggshell Latex 9-300 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
3. ICI DULUX
   a. Primer: 1080 Lifemaster 2000. One (1) coat at 1.4 mil dft. 34% to 38% solids; VOC 0 g/L.
   b. Finish: 1402 Lifemaster Eg-Shell 2000 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
4. Surfaces: Gypsum board wall surfaces.

F. Exposed Structure - Ferrous (Eg-Shel): Dryfall

1. SW
   a. Primer: ProCryl Universal Primer, B66-310 Series (2-4 mils dft)
   b. Finish: Waterborne Acrylic Dry Fall, B42W2 Two coats at minimum 4.5 mils dft.
2. PPG
   a. Primer: Pitt-Tech Int/Ext Primer Finish DTM Industrial Enamel 90-712 (2.0 to 3.0 mils dft).
   b. Finish: Speedhide Interior Super Tech WB Acrylic Dry Fog Latex, 6-725 two coats at minimum 2.5 mil dft per coat.
3. ICI DULUX
   a. Primer: Spraymaster Pro Uni-Grip WB Acrylic Dryfall Eggshell Primer and Finish; 1 coat at minimum 1.5 mil dft;VOC 26 g/L.
   b. Finish: Spraymaster Pro Uni-Grip WB Acrylic Dryfall Eggshell Primer and Finish; 2 coats at minimum 2.0 mils dft per coat;VOC 26 g/L.
4. Surfaces: Exposed metal decking, trusses, structural steel, metal joists.

G. Exposed Structure - Galvanized (Flat): Dryfall

1. SW
   a. Finish: Waterborne Acrylic Dry Fall, B42W2 Two coats at minimum 2.5 mils dft per coat.
2. PPG
   a. Finish: Speedhide Interior Super Tech WB Acrylic Dry Fog Latex, 6-725 two coats at minimum 2.5 mil dft per coat.
3. ICI DULUX
   a. Finish: Spraymaster Pro Uni-Grip WB Acrylic Dryfall Semi-Gloss Primer and Finish; 2 coats at minimum 2.5 mils dft per coat;VOC 39 g/L.
4. Surfaces: Exposed metal decking, trusses, structural steel.

H. Interior Stain Schedule - Wood Trim

1. SW
   a. Stain: Minwax 250 VOC Stains: Colors as selected by Architect.
   b. Finish: Two coats S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series at 1.0 mil dft per coat.
2. PPG
   a. Stain: 250 VOC Stains: Colors as selected by Architect.
   b. Finish: Two coats REX Interior Acrylic Polyurethane Satin Finish 77-49, VOC 236 gal/L at minimum 1.0 mil dft per coat.
3. ICI
   a. Stain: 250 VOC Stains: Colors as selected by Architect.
   b. Finish: Woodpride Interior Waterborne Aquacrylic Satin Varnish, VOC 174 g/L. Two coats.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrate surfaces and installation condition. Report condition(s) that might affect proper application.

B. Do not proceed with painting work until unsatisfactory conditions have been corrected.

C. Initial application of paint to a surface constitutes acceptance of existing conditions and responsibility for satisfactory performance.

D. Examine specification sections of other trades and their provisions regarding painting. Surfaces left unfinished shall be painted or finished as part of the work of this Section unless specifically noted otherwise.

3.02 SURFACE PREPARATION

A. General

1. Broom clean and remove excess dust before painting is started in any area.
2. Broom cleaning is not permitted after operations have begun in a specific area.
3. Surfaces shall be clean, dry and adequately protected from dampness.
4. Surfaces shall be free of any foreign materials that will adversely affect adhesion or appearance of applied coating.
5. Remove any mildew and neutralize the surface prior to applying coating.

B. Concrete

1. Remove splatters, dust and dirt by brushing or water washing with clear water.
2. Remove misplaced mortar.
3. Cracks, abrasions and other defects shall be cut out, patched flush, and sanded smooth and sealed before applying prime coat.

C. Wood - Stained

1. Prime and backprime faces, edges and end with first coat before installation.
2. Sandpaper to smooth and even surface, dust off.
3. Countersink nails.
4. Putty all nail holes, cracks, open joints and other defects with mixture of stain and putty so that appearance of completed work is uniform. Sand smooth and dust off.

D. Structural Steel and Miscellaneous Ferrous Metal

1. Bare Metal Surfaces
   a. Remove grease, oil, dirt and other foreign material prior to prime coat application where necessary according to SP-1, SP-2 and/or SP-3.
   b. Remove rust prior to prime coat application according to SP-11.
   c. Include all hangers and miscellaneous fabricated items.
2. Shop Primed Surfaces
   a. Fill open joints or abrasions in shop prime coat with filler; feather edges, sand smooth, and touch-up with primer compatible with shop primer. Extend primer beyond treated area.
   b. Remove grease, oil, dirt and other foreign material prior to prime coat touch-up where necessary according to SP-1, SP-2 and/or SP-3.
   c. Include all hangers and miscellaneous fabricated items.

E. Galvanized or Zinc-Coated Items

1. Pretreat surfaces prior to application of prime coat with phosphate pretreatment, unless prime coat material to be used is recommended by its manufacturer for direct application over zinc treated surfaces of the type at hand. Follow manufacturer's directions.

2. Remove dirt or grease on surfaces scheduled for paint finish according to SP-1. Wipe dry with clean cloths.
3. Roughen surface with steel wool as necessary to remove gloss.

F. Gypsum Board

1. Fill minor irregularities with spackling paste.
2. Sand to smooth level surface and dust off.
3. Avoid raising nap of paper.

G. Factory Primed Items: Verify compatibility between factory applied primer and finish painting system. If compatibility cannot be guaranteed, then provide barrier coat compatible with both finishes.

H. Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces: Solvent clean in accordance with SSPC SP 1 and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants.

3.03 APPLICATION

A. General

1. Apply all paint in strict accordance with the manufacturer's instructions. Data sheets take precedence over these specifications if more restrictive, except for the minimum DFT specified in the schedule.
2. Do not apply until preceding coat is dry to manufacturer's recommendations.
3. Do not apply to any surface unless it is thoroughly dry.
4. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes if moisture content of surface is greater than recommended by manufacturer.
5. Do not use material that has exceeded the pot life stated by the manufacturer.
6. Apply to the following workmanship requirements:
   a. Neat appearance of finished surfaces.
   b. Absence of ridges, sags, runs, drops, laps, unnecessary brush marks, holidays, air bubbles and excessive roller stipple.
   c. Thorough mixing of paint and limited use of thinners.
   d. Uniformity of film thickness.
   e. Proper drying time between coats.
   f. Protection of unpainted and finished surfaces.
7. Coverage and hide shall be complete. When color or undercoats show through final coat, recoat until the paint film is of uniform finish, color, appearance, and coverage, at no additional cost to Owner.
8. Edges of paint or finish adjoining other materials or colors shall be sharp and clean without overlapping.

B. Methods

1. Application may be by roller, brush, spray or other approved means.

2. When utilizing spraying, be careful not to use methods which will affect other trades work in adjacent areas.

C. Mixing

1. Mechanically mix before use.
2. Agitate during application as required.
3. Do not tint or shade in field unless permitted by Architect.

D. Thinning

1. Dilute only as required to achieve suitable application viscosity.
2. Use only type and amount recommended by manufacturer.

E. Approvals: Do not apply succeeding coat of paint until previous coat has been inspected and written approval is given.

F. Electrical Conduits

1. Do not paint any electrical conduit or boxes unless they are exposed and abutting a surface that is to be painted or stained.
2. Conduits and boxes to be painted shall be given a coat of galvanizing pretreatment followed by the paint system for the adjoining surface.

G. Protection of Surfaces

1. Provide covers, drop cloths and masking to protect unpainted surfaces previously finish painted. Use special care in protecting electrical and mechanical items which may be damaged by the painting operations (i.e., overspray and solvents that might damage the internals of the item).
2. If possible, remove items not to be painted such as hardware, accessories, electrical plates, lighting fixtures and/or trim, mechanical grilles and louvers and similar items in contact with painted surfaces.
3. Use caution when painting exterior work to avoid wind carrying overspray, drippings, etc., onto adjacent structures, facilities and vehicles.
4. Following completion of painting, reinstall removed items by workmen skilled in the trade involved and remove all covers, masking and drop cloths.

END OF SECTION

SECTION 10 14 10

INTERIOR SIGNAGE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work includes:

1. Room numbers.
2. Room identification.
3. Restrooms
   a. Wheel Chair Accessible
   b. Non-Accessible
4. Directional/Informational signs.
5. Emergency escape directories.
6. Posted occupancy limit.

B. All signs which identify permanent facilities/accommodations shall be tactile and braille and limited minimally to room numbers, restrooms, floor identification and room names as deemed appropriate by the Owner.

1.02 SUBMITTALS

A. Shop Drawings: Submit manufacturer's product data, where applicable, and complete drawings showing all identifying devices and installation details in accordance with the requirements of the General Conditions.

B. Samples: Submit samples for materials, finishes, colors, letter styles, etc., as required for selection and approval by Architect prior to fabrication of identifying devices.

C. Final signage schedule must be approved by Owner prior to fabrication. Submittal to Owner should be made through the Architect.

1.03 QUALITY ASSURANCE

A. Signage Standards: Conform to the Americans with Disabilities Act (ADA) Standards where applicable and to the extent as indicated.

B. Acceptable Manufacturers: All units are to be custom fabricated; manufacturer's products meeting the specifications will be acceptable. Manufacturers must be regularly engaged in fabrication and installation of signage units and related identifying devices.

1. Fabricator shall make at least one visit to the site before production begins to review all sign locations and installation conditions with Architect and Owner's representative.

2. Fabricator must review all dimensional changes with Architect.

C. Approvals: All identifying devices shall be approved at the fabricator's shop by the Architect prior to shipment and installation.

D. Spelling and Braille Accuracy: Responsibility of sign manufacturer.

E. The Owner has the right to renumber the room numbers during construction. Manufacturer must not begin fabrication of room number plates until room numbers have been approved by the Owner, in writing, through the Architect.

F. Room identifications will be provided to the Contractor by the Owner during construction.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original shipping cartons with seals unbroken.

B. Protect materials from physical damage.

C. Store materials in clean, dry area.

D. Inspect all materials prior to installation to assure proper function and condition of all items.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Locations, Quantities, Graphics and Copy: As indicated on drawings and/or specified (scheduled) herein.

2.02 MATERIALS

A. Plates: High pressure phenolic "ES" plastic; scratch resistant, non-static, thermoset, rated self-extinguishing.

1. Colors: As selected by Architect.
2. Thickness: 3/32" for ADA plates; 1/16" for non-raised copy (flat) plates.

B. Changeable Copy: Provide 3/32" thick plastic back-up plate laminated to back of face plate to create slot for removable nameplates.

C. Provide an integral method to create tactile and Braille signs; producing a unitary component. Glued on or laminated letters or Braille cells are not acceptable.

2.03 DESIGN GUIDELINES

A. Plate Shape: Square cornered; do not bevel edges.

B. Letter Style

1. ADA Signs: Helvetica medium, all capital letters.
2. All Other Signs: Helvetica medium, mixed upper and lower case.

C. Tactile Letters and Braille: Grade II braille; raised 1/32" above background surface. Provide Braille dome topped same color as background. Sign manufacturer shall be responsible for verifying accuracy of spelling, both tactile and Braille.

D. Letter Size

1. Tactile Signs: Minimum letter size is 5/8" for capital letters. Room numbers to be 1".
2. Non-tactile Signs: Between 3/8" and 1" capital letter height. Larger letters are permitted on directional signs or on signs where reading distance is greater than 15'-0".
3. Overhead Signs: Minimum 3" copy. Mixed upper and lower case is permissible. Non-tactile is permissible.

2.04 METHOD OF MANUFACTURING

A. Tactile Signs: Relief engraved plates.

B. Non-Tactile Signs: Routed engraved.

2.05 SIGNS REQUIRED FOR TACTILE/BRAILLE

A. Room Numbers: 2-1/4" x 6-3/4" plate with 1" numerals centered horizontally on plate with Braille directly below numerals.

B. Room Identification: This sign is in addition to Room Number specified in 2.05A.

1. Size determined by copy requirements, laid out flush left with 3/4" margin on left, room name in 5/8" caps with Braille directly below type copy, all flush left.

C. Restrooms - Wheel Chair Accessible: Approximately 6” wide x 8” high plate with 1" capital letters (MEN or WOMEN), centered on the plate with Braille centered directly below the word. Provide a routed engraved wheel chair access symbol and a universal man or woman symbol located above the word. No border.

D. Restrooms - Non-Accessible: Two plates required.

1. 6-3/4" wide by 3-3/4" high plate with 1" room number centered horizontally on plate with braille centered directly below numerals. "Men" and "Women" will appear in 3/4 inch capital letters, centered horizontally on the plate with Braille centered directly below the word.
2. 6-3/4" x 6-3/4" plate with 5/8" raised caps informing location of nearest accessible restroom. Same message in Braille centered below copy.

E. Directional/Informational Signs: Wall mounted; non-tactile; in upper and lower case. Letter height shall be at least 1" cap height for directional signs. Letter sizes for informational signs may be less than 1".

2.06 SIGNS REQUIRED FOR NON-TACTILE/BRAILLE SIGNAGE

A. Plate Shape: Square cornered; do not bevel edges.

B. Plate Heights

1. 2-1/4" for one line of copy.
2. 3-3/4" for two lines of copy.
3. 5-1/4" for three lines of copy.

C. Changeable Copy Plates

1. Height: Same as in "B" above.
2. Length: 7-1/2"
3. Face openings of slot: 1" high with 3/4" margin at ends and bottom.
4. Allow 1/2" vertically between slot openings.
5. Slots behind openings: Allow for 1-1/4" wide x 1/16" thick blank changeable copy strips supplied by the Contractor for future engraving by Owner.
6. Tactile room numbers with Braille may appear on the face of the sign frame.

2.07 EMERGENCY ESCAPE DIRECTORY

A. Description: 18" x 12". Extruded aluminum "F" frame with anodized medium bronze finish and non-glare acrylic face. Provide with rigid masonite backing.

B. Copy: Color screen printed removable graphic of floor plan showing escape route from installed location. Locate at building main entrance and primary exits.

2.08 POSTED OCCUPANCY LIMIT

A. Posted Occupancy Limit: Provide sign reading, "Maximum Occupants Permitted This Space". Provide signage in accordance with OBC 1003.2.2.5 “Posting of Occupant Load”. Locate signs in the indoor practice field.

2.09 COPY POSITION

A. Lines of copy laid out flush left with a margin of 3/4" along the left edge of plate. Exceptions are small room numbers and restrooms shall be centered on the plate.

B. Left hand, right hand and bottom margins are 3/4". Vertical spacing measured between lower case letters is 3/4". Overall width and height of a plate is achieved with multiples of 3/4".

C. Locate directional arrows in upper left hand corner of plate. Arrows count as one line of copy.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mount signs plumb and level.

B. Mount all identification devices with 3/4" foam tape on all four edges.

3.02 SIGNAGE SCHEDULE

A. Provide the following Sign Plates

1. Room Identification Signs: For bidding purposes, provide 9 room identification signs. Each sign will contain 20 symbols/characters arranged in two lines.
2. Women, combined with room number and handicap symbol and international symbol, as applicable, at each restroom.
3. Men, combined with room number and handicap symbol and international symbol, as applicable, at each restroom.

B. Provide room numbers at all door locations.

C. Emergency Escape Directory: As specified hereinbefore.

D. Directional/Informational Signs: For bidding purposes, provide one per lobby and in the practice area. Each sign will contain 25 symbols/characters arranged in two lines. Locate as directed by Architect.

E. Posted Occupancy Limit: As specified hereinbefore.

F. Sign Locations

1. Single Doors: Locate signs on the wall next to the latch side of the door, 1" from the outside edge of the door frame and with the top edge of the uppermost sign 61-1/2" A.F.F.
2. Pairs of Doors: Locate signs as specified above for single doors, except Architect will direct in field if sign occurs on right or left jamb of opening.
3. Doors with Borrowed Lights: Locate as directed by Architect.

3.03 CLEAN UP

A. After completion of work remove all debris and tools from the premises, clean all adhesive spatter and run-over from finished surfaces and wash all plated clean of fingermarks and soil. Polish sign surfaces with a soft cotton rag.

END OF SECTION

SECTION 10 22 26

FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide sound insulated, manually operated, folding, flat panel operable walls as indicated, complete including required fasteners, fittings and accessories.

1.02 QUALITY ASSURANCE

A. Installer: Factory trained personnel regularly engaged in installation and maintenance of the specified operable wall.

B. Guaranty: Manufacturer shall provide 2 year guaranty covering workmanship, materials, installation and operation.

1.03 SUBMITTALS

A. Shop Drawings: Submit product data and layout drawings in accordance with the General Conditions and Section 01 33 23.

B. Samples: Submit samples of panel finish for selection by Architect.

C. Operation and Maintenance Manuals: Submit manuals and special tools in accordance with Section 01 78 21.

PART 2 PRODUCTS

2.01 FOLDING PARTITIONS

A. Manufacturer: Drawings and specifications are based on MODERNFOLD Acoustic-Seal 933. Equal products by EMCO; HUFCOR; KWIK-WALL and PANELFOLD are acceptable providing they meet or exceed the requirements specified herein.

B. Operation: Consists of a series of continuously hinged , manually operated, flat steel panels, top supported with operable floor seals.

1. Final closure accomplished by expanding jamb from panel edge or hinged panel as required by each door condition (i.e. partitions with pocket doors require expanding jamb).

C. Panel Construction

1. Size: 3 inches thick in manufacturer's standard widths.
2. Panel Skins: 21 gage steel.
3. Core (Frame): 16 gage steel.
4. Top Channel Assembly: Reinforced to support suspension components.
5. "Wrap-around" skin/panel construction shall, with astragal seals, provide a minimum "groove" appearance at the vertical panel joints.
6. Weight: Approximately 10 pounds per square foot (average hanging).

D. Panel Finish: Factory applied, Class 1 rated material, as per OBC with flame spread 0-25 as determined by ASTM E84.

1. Provide reinforced vinyl with woven backing weighing not less than 30 ounces per linear yard. Color and pattern as selected by Architect.

E. Sound Seals

1. Vertical Seals Between Panels: Tongue and groove configuration astragals incorporating vinyl acoustical seals.
2. Horizontal Top Seals: Continuous contact extruded vinyl.
3. Manual Floor Seals: Designed to provide minimum 1 inch nominal operating clearance; activated by a removable handle. Seals on each panel shall be activated simultaneously.

F. Suspension System: Continuous "C" channel shape steel track, supported by adjustable steel brackets connected to structural supports with threaded rods.

1. Panels supported by ball-bearing, steel wheel trolley assemblies.

G. Laboratory Acoustical Performance - tested in accordance with ASTM E90: STC rating of no less than 49. Provide written test results on request.

2.02 POCKET DOOR

A. Manufacturer: Drawings and specifications are based on MODERNFOLD Stowaway Type II. Equal products by other acceptable manufacturers listed in 2.01A are acceptable providing they meet or exceed the requirements specified herein.

B. Door Construction

1. Size: Nominal 2.75 inches thick in equal widths to close opening.
2. Panel Skins: Class A Flame Spread Rated moisture resistant gypsum board.
3. Core (Frame): Extruded aluminum.
4. Top Channel Assembly: Reinforced to support suspension components.
5. Sound Seals: Gasketed astragal seals in vertical edges and jambs; fixed sweeps on horizontal edges.

6. Weight: Approximately 8 pounds per square foot (average hanging).
7. Hinges: Type and quantity as recommended by manufacturer for door height and weight.
   a. Finish: US26D.
8. Provide manufacturers standard latching type hardware.

C. Door Panel Finish: Wood veneer. White oak finished to match wood doors specified in Section 08 14 00. Field finished, see Section 09 91 00.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that openings have been completely prepared in accordance with manufacturer's requirements. Notify Architect of conditions detrimental to operable wall installation and operation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

END OF SECTION

SECTION 11 52 13

PROJECTION SCREENS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide motor operated, above ceiling mount front projection screen complete with all controls, mounting brackets and hardware.

B. Provide manually operated, wall mount front projection screen complete with all mounting brackets and hardware.

1.02 RELATED SECTIONS

A. Electrical: Division 26.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data in accordance with the requirements of the General Conditions and Section 01 33 23.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery items in manufacturer's original protective packaging.

B. Store items in original packaging to prevent soiling and physical damage.

C. Handle so as to prevent damage to finished surface.

PART 2 PRODUCTS

2.01 PROJECTION SCREENS

A. Motor Operated Projection Screen

1. Type: Motor operated, remote controlled, recessed ceiling mounted.
2. Screen: Flame retardant and mildew resistant, mat white with black masking borders. Vertical seams permitted at minimum 6' on center. HDTV 16:9 format.
   a. Provide extra drop length of dimension indicated to comply with the following requirements for fabric color and location of drop length:
      1) Color: Black.
      2) Location: At top of screen.

3) Provide drop length as required for bottom of screen to be set 3' above floor. Coordinate each screen with ceiling/screen mounting height

3. Sizes: As indicated on schedule contained herein.
4. Doors: Independently motorized. Field finished to match ceiling.
5. Motor: 3-wire quick reversal type; ball bearing with automatic overload cut-off and integral interlocking gears.
   a. Power: 115V, 60 Hz, 3.5 amp.
   b. Controls: Key operated 3-position switch ("UP", "OFF", "DOWN").
   c. Provide with pre-set but accessible limit switches to automatically stop screen fabric in the up and down position. Provide positive stop action.
6. Case: Extruded aluminum back, top and front with stamped steel end caps.
7. Mounting Brackets: Provide ceiling mount type brackets of quantity as required by manufacturer.
8. Manufacturer: Signature Series V Motorized Screen with M1300 Viewing Surface by DRAPER or equal by DA-LITE SCREEN COMPANY, BRETFORD/KNOX MANUFACTURING.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install screens in neat, plumb, true alignment in locations indicated on drawings and as detailed. Comply with written installation instructions of screen manufacturer.

B. Coordinate above ceiling mount with ceiling grid layout.

END OF SECTION

SECTION 11 66 26

WALL PADDING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide labor, materials and accessories necessary to install wall padding as specified herein and indicated on drawings.

1.02 SUBMITTALS

A. Submit manufacturer's product data and installation instructions.

B. Shop Drawings: Submit wall padding layout.

1.03 QUALITY ASSURANCE

A. Conform to current code requirements for flame spread and smoke development.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturer: PORTER; AMERICAN ATHLETIC INC.; PROMATS; INSTITUTIONAL PRODUCTS, INC. (IPI), BPI or equal.

B. Description: Panels consisting of 3/8" CDX plywood back, bonded to 1-1/2" polyurethane foam core and 14 oz. vinyl coated nylon facing.

C. Sizes: As indicated on drawings.

D. Color: As selected by Architect.

E. Attachment Clips: “Z” clips mounted on wall and panel for concealed attachment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions. Securely fix wall panels by means of Z-clips attached to wall. Engage panel mounted Z-clips into wall mounted clips. No visible fasteners permitted.

END OF SECTION

SECTION 12 33 55

PLASTIC LAMINATE FACED CASEWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide plastic laminate casework as indicated on drawings.

B. Work includes fabrication and installation of standard base and wall cabinet components, shelving, fillers, panels and other units as indicated.

C. Accessories common to casework are included as work of this section.

D. Related Work Specified in Other Sections
1. Wood Blocking: Section 06 10 00.
2. Countertops: Section 06 61 17.
3. Vinyl Base: Section 09 65 00.

1.02 QUALITY ASSURANCE

A. Fabricator qualifications: A firm specializing in the fabrication of millwork with a satisfactory record of performance on projects of comparable size and quality. Fabricator shall be acceptable to the Architect.

B. Installation: Performed only by experienced skilled finish carpenters.

C. Catalog Standards
1. Manufacturer's catalog numbers, where shown, are for convenience in identifying cabinet work.
2. Use of a specific manufacturer's catalog numbers is not to preclude the use of any other acceptable manufacturer's product or procedures that may be equivalent.

D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard:
1. ANSI: American National Standards Institute.
2. AWI: Architectural Woodwork Institute.
3. NEMA: National Electrical Manufacturer's Association.
4. ASTM: American Society for Testing and Materials.
5. CS: Commercial Standard.

E. Quality Grade: Materials and fabrication shall be "custom grade" in accordance with "Quality Standard Illustrated," of the AWI conforming to the following sections:
1. Section 200: Plywood and particleboard.
2. Section 400: Casework.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's/fabricator's data and installation instructions for each type of casework unit.

B. Samples: Submit samples of specified finishes.

C. Shop Drawings
1. Submit shop drawings for casework showing plans, elevations, ends and cross sections.
2. Show details and location of anchorages and fitting to floors, walls and base.
3. Include layout of units with relation to surrounding walls, doors, windows and other building components.

1.04 DELIVERY, STORAGE AND HANDLING

A. Protect casework during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver casework until concrete, masonry and other similar wet work has been completed and is thoroughly dry, outside door openings are permanently watertight, exterior windows are glazed and, in case of temperature dropping below 60 degrees F., until temporary heating and ventilating systems are in operation.

C. Store casework in dry, well-ventilated spaces with constant minimum temperature of 60 degrees F., and maximum relative humidity of 55%.

1.05 PROJECT CONDITIONS

A. Provide and maintain a constant temperature and humidity before, during and after installation as required to maintain optimum moisture content of installed materials.

B. Obtain measurements and verify dimensions and details before proceeding with finish carpentry.

1.06 WARRANTY

A. Plastic laminate faced casework to be guaranteed by manufacturer, and Contractor jointly and severally to the Owner for three years, to be free of defects due to faulty materials, workmanship, or performance.

B. Warranty not to include damage sustained as a result of abuse, negligence, use beyond that of it's intended function by the Owner, acts of God, or unnatural events or causes beyond the control of the manufacturer.

C. Include repair and replacement of defective materials and components at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Products of the following manufacturers meeting or exceeding the standards specified herein are acceptable:
   1. STEVENS INDUSTRIES, INC.
   2. LSI CORPORATION
   3. TMI SYSTEMS DESIGN CORPORATION
   4. MFI, MERCHANDISE FIXTURES, INC.

2.02 MATERIALS

A. Particle Board (Substrate for Laminate Surfaces): High density industrial grade with a minimum density of 45 pounds per cubic foot and a moisture content between 9% maximum and 6% minimum, meeting or exceeding ANSI A208.1 Grade M-3 or ASTM D1037.

B. Fiberboard: Uniform, medium density conforming to ANSI A208.2. Maximum moisture content of 8%. Meet the following minimum standards:
   1. Internal Bond: 125 psi.
   2. Modulus of Rupture: 4,000 psi.
   3. Modulus of Elasticity: 400,000 psi.
   4. Screw Holding Power: 325 pounds.
   5. Density: Minimum 50 pounds per cubic foot.

C. Hardboard: Tempered, smooth both sides; conforming to ANSI/AHA A135.4 Class 1.

D. Lumber: Optional framing material for concealed framing. Conform to AWI requirements premium grade; provide in suitable species of manufacturer's option.

E. Plastic Laminate: Conform to the requirements of the National Electrical Manufacturer's Association (NEMA) Publication Number LD-3. Plastic laminate shall be WILSONART, FORMICA, PIONITE, or NEVAMAR. Colors, patterns and finishes shall be as selected by Architect from the manufacturer's full range of standard colors, patterns and finishes. Manufacturer, finish and color to match plastic laminate specified in Section 06400.
   1. General Purpose Horizontal Grade: 0.05 inches thick.
   2. General Purpose Vertical Grade: 0.028 inches thick.
   3. Backing Sheet Grade: 0.02 inches thick.
   4. Post-Forming Grade: 0.042 inches thick.
   5. Cabinet Liner: 0.02 inches thick.
   6. Fill and seal plastic laminate joints with Seamfil by KAMPEL ENTERPRISES, INC. or FormFill by FORMFILL PRODUCTS (UNIKA USA). Colors specifically mixed by manufacturer to match plastic laminate.

F. Pressure Fused Laminate/Interior Surfacing

1. Melamine resin impregnated, 100 gram PSM minimum, surface laminated to core under pressure.
2. Meet NEMA LD3.1-1991 GP28 standards and NEMA LD3-1991 CL20 standards.
3. White pressure fused laminate for cabinet interiors behind door and drawers, interiors of all open cabinets unless otherwise specified, and underside of wall cabinet unless otherwise specified.
4. Shall be balanced at all concealed surfaces with phenolic backer. Unsurfaced coreboard not allowed.

G. Hardware Items: All exposed hardware to be polished stainless steel finish.
1. Drawer Slides: Self-closing, side mounting type with nylon tire, steel ball-bearing rollers. Manufactured by BLUM, GRASS, AMEROCK, KNAPE & VOGT; ACCURIDE. Load capacity as follows:
   a. 75 pounds: Drawers up to 3-1/2 inches deep: Similar to ACCURIDE Series 2132.
   b. 100 pounds: Drawers up to 8 inches deep: Similar to ACCURIDE Series 2832.
   c. 150 pounds: Drawers over 8 inches deep, all file drawers: Similar to ACCURIDE Series 4034.
2. Drawer and Door locks: 5-pin tumbler removable core, dead bolt. BEST; NATIONAL LOCK; CORBIN. Key and masterkey locks as directed by Associate Architect. Provide 2 keys per cylinder and 5 masterkeys per master set.
3. Concealed Hinges: European style, self-closing, type as required for construction. Metallamet by HAFELE; similar by GRASS; PRAMETE; BLUM.
4. Continuous Hinge: 780 HD Roton Hinge by HAGER. Aluminum with finish as selected by Architect.
5. Drawer and Door Pulls: Wire pull, 5/16" diameter x 3-1/3" long x 1-5/16" extension. STANLEY, GRASS; BLUM, HAFELE.
6. Adjustable Cabinet Shelf Supports: Provide metal pilaster type or hardwood drilled type, manufacturer's standard.
   a. Metal Type: KNAPE & VOGT (KV) steel nickel plated.
      1) Standards: KV #255 NP for dado installation.
      2) Clips: KV #256 NP.
   b. Wood Type: Provide hardwood verticals with adjustment holes located 1/2" on center. Provide shelf clips of type that locks shelf in place.
7. Catches: Magnetic, STANLEY #45 or equal by NATIONAL LOCK or EPCO.

H. Glue: Waterproof adhesive (phenol, resorcinol or melamine) base meeting requirements of CS 253 for "Wet Use" unless otherwise specified in specific sections.

I. Plywood: Birch hardwood plywood conforming to AWI Section 200 for veneer core material, AWI "custom" grade, provide with waterproof glue.

2.03 FABRICATION - CASEWORK

A. General: Except as specified hereinafter, fabricate all work in accordance with AWI

quality standards as specified. Work not specified with a level of quality shall be not less than Custom quality per AWI.

1. Provide complete factory-fabricated and finished components which, when assembled on site, will provide an integral system of storage and work surfaces.
2. Provide locks where indicated.
3. Make cut-outs and other provisions for the work of other trades and as indicated or required for installation.
4. Assemble cabinets with accurate router grooves 1/8" deep with glue and nails and screws.
5. Apply plastic laminate to exposed ends after assembly to conceal screws in end cabinet.
6. All particle board panels to be balanced construction.

B. Subbases: Provide continuous plywood closed bases capable of being leveled to meet site conditions; subbase to be unfinished to receive resilient base. See Section 09650.

C. Base Cabinets

1. Sides and Bottoms: Construct of 3/4" thick particle board with interior of cabinet finished with cabinet liner or polyester laminate. Provide balanced constructed panels with neutral colored backer sheet at concealed conditions and finish laminate at exposed conditions.
2. Backs: Standard 1/4" prefinished hardboard. Install in housed joints in surrounding panels. All backs exposed to view to be neutral colored except where indicated to match vertical color surfaces.
   Rear, unexposed side of backs to receive continuous hot melt glue at joint between back and sides/top/bottom for sealing against moisture and vermin, and to further contribute to cabinet stability.
3. Frame: Provide frame construction of 3/4" thick particle board or lumber dadoed into sides at the following:
   a. As sub-top.
   b. At all locked drawers and doors.
4. Runners: Provide runners or frame construction between all drawers.
5. Shelves: Provide fixed and adjustable shelves with particle board core where indicated on drawings. Provide shelves adjustable on 1/2" centers. Except for exposed shelving conditions, finish shelves with neutral colored polyester laminate or liner grade laminate. Finish front and rear edges with PVC "T" edge.
   a. Shelves under 36" wide: 3/4" thick, except all open shelves to be 1" thick.
   b. Shelves 36" to 42" wide: 1" thick.
   c. Shelves over 42" wide: Construct in accordance with AWI Section 400 to support minimum 30 lbs./running foot of shelf with deflection limited to 1/4" or provide intermediate supports to limit the span to ranges specified above.
6. Finish
   a. Casework Edges: Except where cabinet design requires matching laminate edges and/or "T" edge, finish front edges of sides, frames,

and bottom with PVC sheet, black, gray or neutral colored as approved by Architect.

b. Exposed Exterior of Casework: Finish exposed portion of cabinet with vertical grade plastic laminate in solid color finish as selected by Architect.

c. Interior of Casework

1) Semi-Concealed (behind doors): Neutral colored polyester or cabinet liner laminate.

2) Exposed: Vertical grade laminate to match exposed casework.

d. Shelves: Same as specified for interior of casework. "T" edge typical except where cabinet design requires matching laminate self edge.

D. Drawers

1. Body: Construct of fiberboard with polyester laminate finish on faces and PVC on exposed top edges. Subfronts, sides and back fabricated with shouldered lock joint or dado construction and routed to receive bottom.
   a. Sides and Back: 1/2" thick.
   b. Subfront: 5/8" thick.
2. Bottom: 1/4" thick prefinished hardboard, housed and glued, into front, sides and back. Underside of drawer to receive continuous hot melt glue at joint between bottom and back/sides/front for sealing and rigidity. Reinforce drawer bottoms as required with intermediate spreaders.
3. Front: 3/4" thick particle board front finished with vertical grade plastic laminate on exposed face and cabinet liner laminate on interior side; total thickness 13/16" thick. Except where cabinet design requires self edge matching laminate edges (see cabinet design), edges to be finished with PVC "T" edging, black, gray or neutral color as selected by Architect; corners rounded.
   a. Where adjacent door sizes require core thickness in excess of 3/4", provide drawer fronts to match door thickness. Verify conditions with Architect.
4. Install on proper sized slides specified herein.

E. Doors: Construct and finish same as drawer fronts except core construction to vary as follows:

1. Doors over 30" x 48": Construct from 1" to 1-1/4" thick particle board core.
2. Doors over 36" x 60": Construct as 1-3/8" thick hollow core units in accordance with AWI Section 1300.

F. Wall Cabinets: Construct and finish same as base cabinets except provide suitable hang rail of 3/4" plywood secured to cabinet frame.

1. Where wall cabinets close to soffit or ceiling, provide fascia scribed to conditions and leveled on bottom to permit level installation of cabinets. Finish of fascia to match cabinet.

G. Design

1. Configuration of casework is indicated on drawings.
2. The detailing and design required to provide rigid, solid and structurally

adequate casework is the responsibility of the fabricator; within parameters of AWI specifications and as approved by Architect.

3. The following conditions require special attention:
   a. Casework exceeding 42" in width between supports.
   b. Sink and/or equipment cutouts and supports.
   c. Countertops exceeding 24" unsupported.
   d. Wall and Ceiling Mounted Casework: Provide integral framing in casework of size, strength, and in locations which allow unit to be screw attached to proper substrate and remain rigidly in place.

PART 3 EXECUTION

3.01 CASEWORK INSTALLATION

A. General
1. Install plumb, level, true and straight with no distortions so that doors and drawers will fit openings properly and be accurately aligned.
2. Shim as required using concealed shims.
3. Where casework abuts other finished work, scribe and apply filler strips for accurate fit with concealed fasteners.
4. Where possible, assemble units into one integral unit with joints flush, tight and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16".
5. Anchor cabinet units securely in place with concealed (when doors and drawers are closed) fasteners, anchored into structural support members of wall construction. Comply with manufacturer's instructions and recommendations for support of unit.
6. Adjust casework and hardware so that doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

B. Base Cabinets
1. Fasten each individual cabinet to floor at toe space, with fasteners spaced at 24" on center.
2. Bolt continuous cabinets together.
3. Secure individual cabinets with not less than 2 fasteners into floor, where they do not adjoin other cabinets.

C. Wall Cabinets
1. Verify that wood blocking has been installed at required locations.
2. Bolt continuous cabinets together.
3. Secure individual cabinets with not less than 2 fasteners into wall (wood blocking), where they do not adjoin other cabinets.

3.02 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.

1. Patch surfaces damaged by installation to prior condition as approved or replace damaged units as directed.

B. Clean shop-finished surfaces, touch-up as required, and remove or refinish damaged or soiled areas, as acceptable to Architect.
   1. Dust cabinet interiors. Clean exterior surfaces to original condition.

C. Advise Contractor of procedures and precautions for protection of materials and installed casework from damage by work of other trades.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Common work results for requirements specifically applicable to Division 22.

B. Requirements of Division 01 Specifications, General Provisions of the Contract and General and Supplementary Conditions apply to this Division.

1.02 REFERENCES

A. AGA: American Gas Association

B. ANSI: American National Standards Institute

C. ASME: American Society for Mechanical Engineers

D. ASTM: American Society for Testing and Materials

E. AWWA: American Water Works Association

F. MSS: Manufacturer's Standardization Society of the Valve and Fitting Industry

G. NEMA: National Electrical Manufacturers' Association

H. NFPA: National Fire Protection Association

I. UL: Underwriters' Laboratories, Inc.

1.03 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01 including required number of copies.

B. Include Products as specified in the individual sections of Division 22.

C. Group submittals to include complete information of related systems, products, and accessories in a single submittal.

D. Prepare shop drawings completely independent of the Engineer of Record's CADD files. Should the Contractor or Vendor wish to use the Engineer of Record's CADD files as the basis for developing their shop drawings, a release form, obtainable from the Engineer or Architect, must be signed and a nominal charge of $30.00 per sheet must be made payable to the engineering firm to cover the cost of preparing the drawings for use by others.

E. Assist in the preparation of coordinated room layouts as specified in Division 01 and Section 23 05 00. Include coordination of concrete pads and foundations including anchor bolt and sleeve locations.

F. Submit copies of shop drawings in accordance with Division 01, for plumbing equipment and piping systems.

G. Brochures: Submit manufacturer's product data and brochures including:
   1. Complete descriptions
   2. Illustrations
   3. Rating data, accessories, dimensional data, and applicable options and features marked for the specific items scheduled on drawings and specified herein
   4. Capacities stated in the terms specified
   5. Performance and rating data for plumbing equipment.

1.04 REGULATORY REQUIREMENTS

A. Perform Work specified in Division 22 in accordance with standards listed below of the latest applicable edition adopted by the authority having jurisdiction. Where these Specifications are more stringent, they shall take precedence. In case of conflict, obtain a decision from the Architect.
   1. NFPA 54: National Fuel and Gas Code
   2. NFPA 101: Life Safety Code
   3. ANSI Handicapped Code-A117.1
   4. U.L. Fire Resistance Index
   5. ASTM E814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops
   6. IBC: International Building Code, with Mechanical and Plumbing Codes
   7. Special regulations, supplement, and amendments of the State and/or local authorities having jurisdiction.

B. Comply with the applicable edition date of each regulation as adopted by the authorities having jurisdiction.

1.05 PROJECT/SITE CONDITIONS

A. Layouts indicated on drawings are diagrammatical and intended to show relative positions and arrangement of piping and equipment. Coordinate work with other trades and with measurements obtained at the job site, as applicable, prior to installation. Generally, install work in locations shown on Drawings. Provide necessary, rises, drops, and offsets to fit in the available space unless prevented by Project conditions.

B. If prevented by project conditions, prepare drawings showing proposed rearrangement of Work, including changes to Work specified in other sections. Obtain permission of Architect before proceeding.

C. Place anchors, sleeves, and supports prior to pouring concrete or installation of masonry work.

D. Determine sizes and verify locations of existing utilities on or near site.

E. Keep roads and other spaces clear of materials and debris.

F. Visit site and be informed of conditions under which Work must be performed.

G. Locate equipment requiring periodic servicing so that it is readily accessible. Provide means of service access, following appropriate manufacturer's recommended service clearance space or, as applicable, means of access using duct, wall, or ceiling access doors.

H. Install piping to leave sufficient space for AHJ inspection of wall construction. Coordinate pipe routing with other trades including but not limited to Division 21, 23, 26 and 28.

1.06 FEES AND PERMITS

A. Obtain and pay for all necessary permits and inspection fees required to perform Division 22 work.

1.07 COORDINATION DRAWINGS

A. Prior to commencement of installation, assist in preparation of coordination drawings for work under this Division, as specified in Division 01. Fully cooperate with persons coordinating and performing work under other Divisions.

B. Drawings shall not be formally submitted but shall be kept on site for reference. Notify Architect of conflicts that cannot be resolved.

1.08 COMPLETENESS OF WORK

A. The Contract Documents depict plumbing systems which are intended to be complete and functioning systems. All products, materials, and labor necessary to render a fully functional system to fulfill the design intent shown on the documents shall be provided by the Contractor.

B. Catalog numbers referenced throughout the Division 22 Drawings and Specifications are intended to convey a general understanding of the type and quality of the product required. Where written descriptions differ from information conveyed by a catalog number, the written description shall govern. No extra shall be allowed because a catalog number is found to be incomplete or obsolete.

1.09 REFERENCE STANDARDS AND DEFINITIONS

A. Comply with provisions of Division 01.

1.10 PRODUCT SUBSTITUTIONS

A. Comply with provisions of Division 01.

1.11 RECORD DRAWINGS

A. Provide record drawings that illustrate the work of Division 22 as finally constructed. Deliver record drawings to the Architect in a form suitable for production.

B. Record drawings shall reflect all changes made to the Contract Documents, whether generated by addenda, change orders, or field conditions. Maintain a daily record of these changes and keep current set of drawings showing these changes.

C. Deliver record drawings to Architect within 30 days of Substantial Completion.

1.12 OWNING AND OPERATING MANUALS

A. Comply with the requirements of Division 01, but provide a minimum of three sets.

B. Manuals shall include clear and comprehensive instructions with appropriate graphics and project specific marked data to enable owner to operate and maintain all systems specified in this Division.

C. Copies of reviewed submittals on furnished shall be included.

PART 2 PRODUCTS

2.01 EQUIPMENT SUPPORTS

A. Structural steel for supports: ASTM A36.
   1. Use galvanized members installed in areas of high humidity or condensation, and outside.
   2. Furnish other members with shop coat of red primer.
   3. Retouch primer after field welding.

2.02 FLASHINGS AND COUNTERFLASHINGS

A. Furnish materials and coordinate installation for flashing and counterflashing roof penetrations for vents, pipe, drains, and ducts.

B. Materials:
   1. Sheetmetal: 24 gauge minimum ASTM A525, Class G90
   2. Sheet lead: 3 pounds per square foot
   3. Stainless steel: Minimum 20 gauge
   4. Sheet copper: 24 OZ/SF
   5. Vent Stack Fitting: Josam 1830 or Jay R. Smith 1750

2.03 WALL AND CEILING ACCESS PANELS

A. Style and type as required for material in which installed.

B. Size: 24"x24" minimum, as indicated, or as required to allow inspection, service and removal of items served.

C. 14 gauge minimum sheet metal for doors, 16 gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction.

D. Panels shall have spring hinges with screwdriver locks in non-public areas. Key lock, keyed alike, for panels in public areas.

E. Prime painted or rust inhibitive paint finish.

F. UL labeled when in fire-rated construction, 1-1/2 hour rating.

G. Provide in walls, floors, and ceilings to permit access to all equipment and piping requiring service or adjustment. Examples of such equipment needing access are valves, and equipment needing periodic or replacement maintenance.

H. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.

I. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers.
   1. For masonry and drywall construction: Milcor Style M
   2. For plastered masonry walls and ceiling: Milcor Style K
   3. For ceramic tile or glazed structural tile: Use stainless steel panels

2.04 PIPE ENCLOSURES

A. Minimize number of covers by enclosing maximum number of pipes in each drop.

B. Anchor to equipment or partition.

C. Fasten seams and joints with stainless steel pop rivets.

D. Provide 1-1/2" ceiling flange as closure.

2.05 SLEEVES

A. Materials
   1. Concrete floors, concrete and masonry walls: 18 gauge galvanized sheetmetal.
   2. Drywall partitions: 18 gauge galvanized steel sheet metal.

B. Sleeves shall be sized such that the annular space between outside surface of pipe or pipe insulation and the inside surface of the sleeve is not less than 1/2". Provide larger annular space if required by firestopping product installation instructions.

C. Sleeves supporting riser piping 4" and larger shall have three 6" long reinforcing rods welded radically at 120 degree spacing to the sleeve and shall be installed with the rods embedded in the concrete slab.

PART 3 EXECUTION

3.01 EXCAVATING AND BACKFILLING

A. Contractor shall review Division 33 and shall perform excavation and backfilling in accordance with the most stringent requirements. Contractor shall request clarification before proceeding if there are conflicting instructions.

B. Contract Documents show the approximate location of underground utilities known to exist in the area of construction. Contractor shall determine the exact location of utilities
   1. Locate and uncover existing utilities which require new connections before trenching in the vicinity of indicated utility connection.
   2. Clear all vegetation and other objectionable material from the area required for the excavation and backfill operations. Disposal of material removed by the clearing operation shall be approved by the Owner's Representative.

C. Provide trenching, excavating, and backfilling necessary for performance of work indicated in Contract Documents.

D. Excavate to depths indicated on the drawings or as necessary to permit the installation of pipe, bedding, backfill, structures or appurtenances. Provide a firm, undisturbed, uniform surface in the bottom of trenches. Where excavation exceeds the required depth, bring the excavation to proper grade through the use of an approved incompressible backfill material. Store excavated material and dispose of surplus excavated material.
   1. Excavate trench to sufficient depth to permit a minimum of 36" of cover over the top of the pipe unless otherwise required by pipe elevations indicated on the Drawings. The trench width shall be 18" plus the diameter of the pipe and/or the largest bell.

E. Trenching and excavation shall be unclassified. No extra will be paid in the event that rock is encountered.
   1. Should rock excavation be required, use only experienced personnel for blasting.
   2. Exercise extreme care when blasting with signals of danger given before firing any charge.
   3. Conform to and obey all public authority regulations for the protection of life and property.

F. Provide sheathing, shoring, dewatering, and cleaning necessary to keep trenches and their grades in proper condition and to meet applicable codes.

G. Provide a minimum of 6" of No. 67 crushed stone or clean sand bedding, or equal, in the bottom of the trench to maintain the required grade and continuous support of the bottom quadrant of the pipe. On bell and spigot piping, dig bell holes so bottom of bells do not support pipe.

H. Upon completion of excavation, and prior to the laying of the pipe, the trench bottom shall be brought up to the required elevation with min. 6" pipe bedding. Pipe bedding shall be select material deposited in the trench, and shall be compacted, leveled off, and shaped to obtain a smooth compacted bed along the laying length of the pipe. Material for pipe bedding shall comply with local codes. In absence of local code requirements the bedding shall be bank sand or select back fill material approved by the Architect. Any material used shall pass a 1/4 inch screen.

I. Clean and inspect pipe for defects before lowering into trench for assembly. Install pipe in accordance with provisions of Contract Documents and with the recommendations of the pipe manufacturer.
   1. Ensure pipe is of proper strength and classification for specified service. Discard damaged or defective pipe discovered during pipe laying operations.

2. Maintain alignment and grade during layout operation. Use acceptable method for maintaining grade and alignment to produce desired results.

J. Where crushed stone backfill is required, use No. 67 stone, clean sand or equal.
   1. After bedding has been shaped and the pipe assembled, place crushed stone carefully around the pipe and to a point 12" above the pipe. Backfill above this point shall be as described below:
      a. Backfill areas of vehicular traffic shall consist entirely of crushed stone and compacted crusher run material.
      b. Backfill for shoulders of roadways, sidewalk, and slab on grade structures shall consist entirely of crushed stone.
      c. Backfill areas not subject to vehicular traffic may consist of suitable excavated material as described above.
   2. Where crushed stone is not required, suitable excavated material may be utilized. This includes fine, dry earth or a mixture of earth and shot rock. Rocks larger than 6" in any dimension may not be included in any portion of the backfill material.
   3. Trenches shall be backfilled only after piping has been inspected, tested, and approved by the Architect . All backfill material shall be placed in the trench either by hand or by approved mechanical methods. The compaction of backfill material shall be accompanied by tamping, with hand tools or approved pneumatic tampers, by using vibratory compactors, by puddling, or by any combination of the three. The method of compaction shall be approved and all compaction shall be done to the satisfaction of the Architect. Backfill completely around pipe, including 18" above the pipe, with suitable bank sand, tamped in 4" layers under, around, and over pipe. Water down backfill as required. The remainder of the backfill shall be select backfill material tamped at intervals of no more than 12" depths. All materials to be used as selected material backfill shall be approved by the Architect. If, in the opinion of the Architect, the excavated material does not meet the requirements of selected material, the Contractor shall be required to screen the material prior to its use as selected material backfill. Material used in the upper portion of the backfill or subgrade shall not contain stone, rock, or other material larger than six inches in its longest dimension. No wood, vegetable matter, or other material which, in the opinion of the Architect, is unsuitable shall be included in the backfill. The upper 24" of backfill may be water jetted, if desired. Backfill shall be brought up to finish grade identified on the Architectural Drawings, including additional backfill required to offset settlement during consolidation.

3.02 CUTTING AND PATCHING

A. Repair or replace damage caused by cutting or installation of work specified in Division 22.

B. Perform repairs with materials which match existing and install in accordance with the appropriate section of these specifications.

3.03 FLASHING AND COUNTERFLASHING

A. Counterflash pipes where penetration of roofs and outside walls occur.

3.04 CONNECTION TO EQUIPMENT FURNISHED BY OWNER

A. Connect or install equipment shown on plumbing drawings that requires plumbing connections.

B. Provide piping, shutoff valves, unions, and other piping appurtenances required for a complete installation. Provide backflow preventers and/or pressure reducing valves where required by the equipment design or local code. All components shall be line size unless noted otherwise.

3.05 DELIVERY, STORAGE, AND PROTECTION

A. Insofar as possible, deliver items in manufacturer's original unopened packaging. Where delivery in original packaging is not practical, provide cover and shielding for all items with protective materials to keep them from being damaged. Use care in loading, transporting, unloading, and storing to keep items from being damaged.

B. Store items in a clean, dry place, and protect from damage. Plumbing equipment may not be staged or stored outdoors unless intended for outdoor use.

C. Protect nameplates on motors, pumps, and similar equipment. Do not paint or insulate over nameplate data.

D. Protect plumbing fixtures and brass or chromium plated trim, valves and piping from damage. Cover fixtures during work of finishing trades.

E. Keep dirt and debris out of pipes and ducts.

F. Repair, restore, and replace damaged items.

G. Cover factory finished equipment during work of finished trades.

3.06 SLEEVES

A. Floors: Sleeve all pipe penetrations. Extend sleeve 1-1/2" above finished floor, except piping within pipe chases. Sleeve shall be flush with underside of floor.

B. Masonry or concrete walls: Sleeve all pipe penetrations. Sleeves shall be flush on both sides of wall.

C. Drywall partitions: Sleeve all penetrations of piping in systems over 160 degree F.

D. Seal voids between outside surface of sleeve and wall, partition or floor. Seals shall be airtight.

E. Install piping, insulation and sleeves in strict accordance with applicable U.L. floor or partition assembly instructions. Coordinate with Division //CSI //MF95 7//MF04 07//END_CSI firestop manufacturer's installation instructions.

F. Penetrations not sleeved or firestopped:
   1. Seal voids between pipe and partition. Seals shall be airtight.

3.07 CLEANING PLUMBING SYSTEMS

A. General Cleanup:
   1. Upon completion of contract and progressively as work proceeds, clean up dirt, debris, oil materials, etc., and remove from site, keeping premises in neat and clean condition to satisfaction of the Architect. See Division 01 of specifications for further requirements.
   2. See page, discoloration or other damage to parts of the building, its finish, or furnishings due to Contractor's failure to properly clean piping systems or duct systems shall be repaired without cost to the Owner.

B. Factory Finishes:
   1. Clean items with factory finishes. Touch up bare places, scratches and other minor damage to finishes. Use only factory supplied paint of matching color and formula. If finishes are badly damaged or if there are many damaged, scratched or bare places, refinish the entire item.

C. Domestic Water System:
   1. Flush system progressively by opening building operable valves, faucets and hose bibs and permitting flow to continue from each unit until water runs clear.
   2. Sterilize system in accordance with requirements of State Department of Public Health by the following method or other methods acceptable to authority having jurisdiction.
   3. Introduce chlorine or a solution of calcium or sodium hypochlorite. Fill lines slowly and apply sterilizing agent at a rate of 50 ppm of chlorine as determined by residual chlorine tests at ends of lines. Open and close all valves while system is being chlorinated.
   4. After sterilizing agent has been applied and left standing for 24 hours, test for residual chlorine at ends of lines. If test indicates there is less than 25 ppm, repeat sterilizing process.
   5. After system has been standing 24 hours and test indicates at least 25 ppm of residual chlorine, flush out system until all traces of chemical used are removed.
   6. Have local health department check and approve system before connecting it to existing water system.

3.08 SYSTEMS TESTING

A. Test all systems and equipment installed to demonstrate proper operation.

B. Advise Architect of scheduled systems testing and completed system demonstration/operation schedules so that he may witness, if desired.

C. Correct and retest work found defective when tested.

D. Make repairs to piping systems with new materials. Peening, doping, or caulking of joints or holes will not be acceptable.

E. Domestic Water Piping: Test hot and cold water piping systems upon completion of rough-in, before fixtures are connected, at a hydrostatic pressure of 125 psig or 150% of working pressure whichever is greater for a period of two hours.

F. Drainage and vent system
   1. Test plug opening to permit system to be filled with water, and subject system to 10 foot head of water pressure. System shall hold water for 30 minutes with a drop in water level not to exceed 4 inches in a 4 inch diameter standpipe, and without visible leakage.
   2. If system is tested in sections, a minimum head of 10 feet shall apply.

END OF SECTION

SECTION 22 05 23

VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED WORK

A. Section 22 11 16: Domestic Water Piping

1.02 QUALITY ASSURANCE

A. Valve bodies, shells, and seats: Factory tested.

B. Bronze body valves:
   1. Materials for pressure containing parts: ASTM B-62 (less than 200 psi), B-61 (200 psi and above)
   2. Design, workmanship, testing: MSS-SP-80

C. Iron body valves:
   1. Materials for pressure containing parts: ASTM A126, Grade B
   2. Face-to-face and end-to-end dimensions: ANSI B16.10
   3. Design, workmanship, testing: MSS-SP-70, 71

D. Butterfly valves:
   1. Face-to-face and end-to-end dimensions: MSS-SP-67

E. Valve stems: ASTM B584-78, Class 13C (cast silicon brass), ASTM B-371-79, Alloy A (rolled silicon brass), or other material equally resistant to dezincification.

F. Pressure castings: Free of impregnating materials.

G. Valve name or trademark and working pressure stamped or cast into body.

H. Standard for 200 PSI and 300 PSI valves with metallic seats: ASTM B61-76.

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Iron body valves: Nibco, Stockham, Crane, Milwaukee, Dezurik, Mueller, or Kennedy

B. Bronze body valves: Nibco, Stockham, Milwaukee, Dezurik, or Kennedy

C. Butterfly valves: Nibco, Stockham, Crane, Mueller, or Dezurik

D. Ball valves: Nibco, Apollo, Watts, Milwaukee, Jamesbury or Hammond

2.02 MATERIALS

A. Nibco Figure numbers are indicated below unless noted otherwise:

B. Check Valves:
   1. Domestic Water:
      a. 2" and less, Figure T-433, or S-433, threaded or solder, Class 150
      b. 2-1/2" and up: Bronze body, cap, and disc, flanged, Class 150

C. Ball Valves
   1. Domestic Water
      a. 2" and less, Figure T585-70 or S-585-70, 2-piece, full port, 600 psi, WOG, TFE seats
      b. 2-1/2" and up, Watts G4000-FDA-200 psi, Class 125 meeting MSS-SP-72-92 or equal

D. Butterfly Valves - 2-1/2" And Up:
   1. Domestic Water: Figure LD-2000, lug type, 200 psi, Class 125, EPDM liner, and aluminum bronze disc, meeting AWWA C504-88.
   2. Butterfly valves rated bubble tight for dead end service at full pressure in both directions without the need for downstream blind flange.
   3. Provide hand wheel and closed housing worm gear on valves 8 inches and larger. Provide clamp lock hand lever operators on valves less than 8 inches.

E. Valve connections: Two inches and smaller - threaded; 2-1/2 inches and larger - flanged.

F. Provide chain operators for gate valves, butterfly valves, and plug cocks located in mechanical rooms as required by mechanical plans or where valves are mounted above 7'-0" A.F.F.

PART 3 EXECUTION

3.01 INSTALLATION

A. Furnish and install valves in each piping connection at each piece of plumbing equipment to allow equipment to be isolated from piping systems.

B. Furnish and install valves above each group of plumbing fixtures.

C. Install valves in water piping systems so ordinary maintenance work can be performed on the equipment that the valves isolate, without having to drain the system beyond the valve.

D. Locate valves so as to be easily accessible by maintenance personnel.

END OF SECTION

SECTION 22 05 29

HANGERS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED WORK

A. Section 22 11 16: Domestic Water Piping

B. Section 22 13 16: Sanitary Waste and Vent Piping

C. Section 22 07 00: Plumbing Insulation

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Anvil, Carpenter and Patterson, Fee and Mason, B-Line, Viking, Reliable, and Michigan. Anvil numbers are used for reference.

2.02 HANGERS

A. Anvil Figure #260 MSS Type 1, clevis hangers for:
   1. Non-insulated steel and galvanized piping 2" through 24" diameter
   2. Non-insulated cast iron pipe
   3. Non-insulated PVC piping

B. Anvil Figure #260 clevis hangers with Figure 167, MSS Type 40 galvanized insulation protection shields (sized for supporting insulation having a compressive strength of 4 psi). Support piping on outside of insulation. Size hangers so that pipe insulation passes through them without interruption.
   1. Domestic hot water piping above 160 degrees F. 4" diameter and less
   2. All other insulated piping

C. Anvil Figure CT-69, MSS Type 10 with adjustable wrought tubing ring hanger, copper plated for:
   1. Non-insulated copper tubing with no longitudinal movement

D. Anvil Figure #CT-121, MSS Type 8, riser clamps (at floor penetrations) to support:
   1. Copper pipe risers

E. Anvil Figure #261, MSS Type 8, riser clamps (at floor slab penetrations) to support:
   1. Steel pipe risers
   2. PVC pipe risers

F. Anvil Powerstrut Trapeze Hangers: Where three or more lines of pipe run parallel, support them with trapeze hangers.

2.03 INSERTS

A. Concrete Insert: Anvil Figure #281, MSS Type 18, universal concrete inserts, adequately sized and correctly positioned to support full load operating systems.

B. Concrete Insert, Wedge Type: Anvil Figure #281, 1/4" to 7/8"

C. Lightweight Concrete Insert: Anvil Figure #285

D. Continuous Concrete Insert: Anvil Powerstrut Figure #PS-349 pre-galvanized

2.04 EXPANSION ANCHORS

A. Hilti Kwik-bolt, zinc plated, metal expansion anchor.

B. Anchor to meet U.L., ICBO-4627 and FM listings.

2.05 CLAMPS

A. C-Clamps: Anvil Figure #92, MSS Type 23.
   1. Use these for attaching hangers to steel beams. Do not weld hanger rods to structural steel members.

B. Malleable Beam Clamps: Anvil Figure #218, MSS Type 30: Use these for attaching hangers to bar joists.

PART 3 EXECUTION

3.01 PIPE HANGERS

A. Support pipes on specified hangers so that equipment, pumps, and fittings do not bear weight or stresses from vibration and swaying of pipe. Support pipe risers at regular intervals in pipe shafts at least once at each floor level or a maximum of 12'-0" apart. Do not use perforated metal, strap iron, or band iron. Do not make offsets in hangers.

B. Maximum allowable spacing of pipe hangers is listed below. Space hangers and brackets at closer intervals where necessary to maintain levels, slopes, and drainage, or to prevent sagging or swaying of pipe.

C. COPPER PIPE - Water
   1. 1/4" to 1-1/4" - 5'0" O.C.
   2. 2" to 2-1/2" - 8'0" O.C.
   3. 3" and above - 10'0" O.C.

D. CAST IRON PIPE
   1. Space hangers not to exceed 10 feet on centers. Provide minimum of two hangers per section close to joint on barrel and at change of direction and branch connection.

E. PVC PIPE
   1. 3/4" to 3" - 4' O.C.
   2. 4" and above - 8' O.C.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION OF PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification of plumbing piping and equipment as specified herein.

1.02 RELATED WORK

A. Division 01: Cutting and Patching.

B. Division 01: Seismic Requirements.

C. Division 01: Shop Drawings, Product Data, and Samples.

D. Division 01: Storage and Protection.

PART 2 PRODUCTS

2.01 NAMEPLATES AND TAGS

A. Acceptable manufacturers: Seton Nameplate Corporation, Marking Services Inc. or equal.

B. Rigid plastic, "Setonite" or Bakelite with engraved lettering, minimum 1/2" high.

C. Brass tags, at least 1-1/2" inches in diameter, with alpha-numeric I.D., permanently stamped black filled letters showing the service, and black filled numbers showing the valve or equipment number. At substantial completion, a schedule of all valves shall be submitted to the Architect and Owner's Representative.

2.02 PIPE MARKERS

A. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering.

B. Plastic Tape Markers: flexible vinyl film tape with pressure sensitive adhesive and printed marking.

2.03 PIPE IDENTIFICATION AND PAINTING

A. Identify all piping as specified herein painted under Division 09.

B. Pipe Identification:
   1. Identify piping by stenciling or tagging (to denote contents and direction of flow) on piping at no more than 25 foot intervals at valves, and at least once in each

separate space through which the pipe passes. Colors shall conform to ASME 13.1.

2. Stenciling shall be a minimum of 2" high letters.

C. Buried piping does not require identification marking, unless noted otherwise in specifications.

D. All piping in central plant and mechanical rooms shall be labeled to identify contents and direction of flow.

2.04 EQUIPMENT AND APPARATUS IDENTIFICATION

A. Acceptable Manufacturers: Seton Name Plate Corporation or equal.

B. Nameplates: Rigid plastic, "Setonite" or Bakelite, with engraved lettering (indicating names and numbers of mechanical apparatus), a minimum of 1/2" high. Fill engraved lettering with a permanent coloring material which contrasts with color of tag material to allow for easy reading.

C. Use names, numbers and abbreviations appearing in schedules on Contract Drawings.

D. Where stenciling is used to identify large pieces of equipment, stenciling shall be in a conspicuous place visible from control panel area and of at least one (1) inch letters and/or numbers. Large pieces of equipment may be stenciled with an oil based enamel or semi-gloss latex.

E. Provide nameplates, located in a conspicuous location directly on the equipment or apparatus, for mechanical equipment including, but not limited to:

1. Plumbing equipment

F. Name tag Fasteners: Commercial quality, rust resisting nuts and bolts with backwashers, self-tapping screws, or rivets. If equipment surface does not allow for direct attachment, use copper or brass rings to attach tags.

G. Valve Tags

1. Each valve shall be identified with a brass tag. The tag shall contain an alpha-numeric I.D. which shall include floor level and building section as part of the I.D.
2. A valve schedule shall be provided to Architect and Owner's Representative. Mount valve schedule under glass and mount as directed by Owner's Representative.
3. Securely fasten tags to valves with a brass "S" hook or chain.

END OF SECTION

SECTION 22 07 00

PLUMBING INSULATION

PART 1 GENERAL

1.01 DEFINITIONS

A. Exposed - Equipment and piping in areas which will be visible without removing ceilings or opening access panels.

B. Concealed - Installed above ceiling, in walls or chases.

C. Outdoors - Exposed to the weather or ambient conditions.

D. Underground - Buried.

1.02 CERTIFICATION/QUALITY ASSURANCE

A. Insulation, adhesives, coatings, sealers, tapes, shall have a flame spread rating of 25 or less and smoke development of 50 or less in accordance with ASTM E-84 and UL 723

B. Materials shall meet the requirements of NFPA 90-A.

1.03 SUBMITTALS

A. Submit manufacturer's product data and installation procedures for review.

PART 2 PRODUCTS

2.01 PIPE AND EQUIPMENT INSULATION

A. Materials for Pipe and Equipment: Provide factory pre-molded insulation for pipe, pipe fittings, and valves.

B. Fitting insulation: Same thickness and material as adjoining pipe insulation.

C. Fiberglass Pipe Insulation:
   1. Acceptable manufacturers: Johns-Manville "Micro-Lok 850"; CertainTeed; Knauf; Owens Corning. Foster Jacket: ASJ fiberglass reinforced kraft paper with aluminum foil; minimum R value of 3.7.
   2. Use on the following services:
      a. Domestic hot water supply piping - 1" thick
      b. Domestic cold water piping - 1/2" thick
      c. Drain bodies, traps and horizontal drain lines receiving cold condensate - 1/2" thick

2.02 MATERIALS FOR FITTINGS, VALVES, AND SPECIAL COVERINGS

A. For all services, use pre-molded insulation for pipe fittings, elbows, tees, butterfly valves, and couplings 2-1/2 and larger. Finish shall be as specified under Products above or as specified below. PVC fitting covers with fiberglass inserts may be used on piping fittings elbows and valves 2" and less for the following services:
   1. Domestic Cold Water
   2. Domestic Hot Water

B. For piping installed above grade exposed-to-the-weather outside the building, cover straight pipe insulation with 0.016" thick aluminum jacket equivalent to Childers and cover fittings with factory formed covers equivalent to Elljacs.

C. For flexible tubular elastomeric pipe and fitting insulation when exposed-to-view inside building or exposed to the weather, finish with two coats of fire retardant self-extinguishing vinyl lacquer type highly flexible coating equivalent to Armacell "Armaflex Finish", custom color blended to match surrounding surfaces.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Deliver and store insulation materials in manufacturer’s containers and kept free from dirt, water, chemical and mechanical damage.

B. Complete piping pressure testing prior to applying insulation.

C. Apply insulation in workmanlike manner by experienced and qualified workmen.

D. Surfaces shall be clean and dry when covering is applied. Covering to be dry when installed and before and during application of any finish, unless such finish requires specifically a wetted surface for application.

E. Adhesives, cements and mastics shall be compatible with materials applied and shall not attack materials in either wet or dry state.

F. Stop duct coverings, including jacket and insulation, at fire penetrations of fire or smoke rated partitions, floors above grade and roofs. "Fan-out" or extend jacketed insulation at least 2" beyond angle frames of fire dampers and secure to wall. Maintain vapor barrier.

3.02 FLEXIBLE SHEET ELASTOMERIC INSULATION

A. Prior to application of flexible sheet elastomeric insulation, thoroughly clean all metal surfaces, making sure that all dirt, scale, loose paint, plaster, and oil has been removed and that surfaces are dry. If surface has been primed, test a two square foot section using adhesive equivalent to Armstrong No. 520 in order to determine whether solvent in adhesive will loosen or lift the primer. If primer is loosened, then remove it. When testing proves acceptable, adhere insulation with smooth side out, using thin but adequate coating of same adhesive. Follow manufacturer's instructions. Coat all butt edges of each

sheet. Stagger all joints. Insulate all standing seams or flanges with same thickness of insulation material as that used on main surface.

3.03 INSTALLATION OF PIPE AND EQUIPMENT COVERING

A. Where glass fiber or flexible tubular elastomeric insulation is used on piping sized 2" and larger, insert a section of foamglass or calcium silicate insulation, at hanger or support points, between pipe and metal shield for full length of shield, to prevent crushing of insulation. Where insulation passes through pipe hangers and across trapeze supports, 12" long metal saddles shall be used. Insulation thickness to be same as adjoining glass fiber insulation. On cold pipe, vapor barrier should be carried through the hanger and sealed. Saddles shall be used where rigid foamglass inserts are not acceptable.

B. Apply foamglass insulation as follows:
   1. Both the circumferential and longitudinal joints shall be buttered with fire-resistive pliable sealer. Voids and cracks shall be filled with sealer. Mastic shall be Foster 30-80 or equal. Secure insulation with 3/4" wide x 0.010" thick aluminum bands on 8" centers.
   2. The circumferential joints shall be staggered.
   3. Fittings, valves, flanges, traps, and air vents shall be insulated with the same thickness of insulation using factory fabricated fitting sections or pre-molded insulated fittings.
   4. Block type insulation shall be adhered by stick-clips or bands, in addition to the sealer, as required to provide support for the insulation.
   5. Finish above furred ceilings and in chases shall be the bare insulation.
   6. Finish in equipment rooms and elsewhere where exposed-to-view shall be //OPT_AR //CHO_S white ASJ jacket.//CHO_N .016" aluminum jacket.//CHO_N white 8 oz canvas paintable jacket.//END_OPT
   7. Finish where exposed-to-the-weather shall be .016 inch thick, Childers, or equal, aluminum jacket on lines and Elljacs, or equal, pre-formed aluminum covering on fittings.
   8. Finish on underground insulation shall be Pittsburgh Corning Pittwrap as recommended by manufacturer.

END OF SECTION

SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Piping and pipe fittings for domestic cold and hot water piping

1.02 RELATED WORK

A. Section 22 05 00: Common Work Results for Plumbing

1.03 SUBMITTALS

A. Submit product data for review on piping and fittings. Submittal data shall include:
   1. Manufacturer of pipe.
   2. Tests or listings by recognized testing laboratory that certifies material composition is in accordance with ANSI/ASTM requirements.
   3. Product data for pipe and fittings to be used on each piping system.
   4. Solder and brazing product data and installation procedures for copper pipe.

PART 2 PRODUCTS

2.01 COPPER PIPE

A. Conform to ASTM B-88 specification for wrought seamless copper.

B. Type L, hard for:
   1. Domestic cold water piping
   2. Domestic hot water

C. Use Type K, rolled, soft for: Piping installed under floor slabs.

2.02 COPPER PIPE FITTINGS

A. Sweat type, wrought copper, ASTM B62, with dimensions conforming to ANSI B16.22 and sweep patterns for copper tubing.

B. Mechanical Couplings: Roll groove rigid type by Victaulic, Gruvlok or Anvil.

C. Mechanically formed tee fittings: "T-Drill" system in compliance with Copper Development Association (CDA), Copper Tube Handbook, and ASME Code for pressure piping ANSI B31.5C. All joints shall be brazed in accordance with CDA Copper Tube Handbook using BCuP filler material. Soft solder joints will not be approved.

D. Mechanical joints: Domestic cold and hot water piping 4" and larger may be joined with rolled grooved copper fittings and valves by Victaulic or Anvil, copper pipe grooved

systems. Gaskets shall be rated for not less than 220 degrees. Joints, materials, and gaskets for grooved systems shall be approved for use in potable water systems.

E. Dielectric Connections:
   1. Provide at junction of copper pipe and equipment with steel piping systems.
   2. Central, Dielectric insulating unions, and insulating flange unions, as manufactured by Central Plastic Company, or CTS Fabrication USA (1-1/2" thru 8").
   3. Provide copper solder joint to plated female iron pipe for sizes 1/2" through 2".
   4. Provide insulating flange unions, malleable female iron pipe thread to copper solder joint flange unions for sizes 2-1/2" through 4".
   5. Brass fittings and valves may not be used for dielectric union locations.

F. Unions: Brass ground joint, 250 lb. working pressure.

G. Nipples: Brass.

H. Grooved copper system:
   1. Victaulic Style 606 or Style 641 rolled grooved copper fittings for domestic cold water and domestic hot water for sizes 3" and larger

2.03 DUCTILE IRON WATER PIPE AND FITTINGS UNDERGROUND

A. Manufactured in accordance with latest revision of ANSI A21.51/AWWA C151.

B. Use Class 52 thickness or heavier for 12" diameter and less and Class 51 thickness or heavier for 14" diameter and larger.

C. Furnish pipe with standard thickness cement lining on inside with a bituminous seal coat and a bituminous coating on the outside.

D. Clearly mark pipe exterior to indicate the manufacturer, date of manufacturer, pipe class and weight.

E. Provide for the following services:
   1. Underground domestic water main services, up to first joint inside interior space

F. Fittings:
   1. Acceptable Manufacturers: Fastite by Acipco, Tyton by U.S. Pipe Co., or Bell-Tite by James B. Clow and Sons
   2. Ductile iron, cement lined, bituminous coated, manufactured in accordance with the latest revision of ANSI/AWWA C110
   3. Furnish with mechanical joints conforming to ANSI A21.11 with 250 psi pressure rating

2.04 PVC AND CPVC PIPE AND FITTINGS

A. Polyvinyl chloride sewer pipe and fittings (4" to 12" diameters) shall be as manufactured by Charlotte or equal. Fittings (14" to 24" diameter) shall be manufactured by Freedom Plastics, Inc.

B. PVC and CPVC pipe, fittings, cement, and joint cleaner for entire project shall be supplied by a single manufacturer.

C. PVC schedule 40, type 1, DWV, ASTM D-2665, 1120, 160 PSI at 73 degrees F. Solvent cement shall meet ASTM No. D-2564 for (PVC-DWV) plastic and pipe fittings. If permitted by governing code authority, may be used for:
   1. Inside gravity { [under floor slab], under and above floor slab in non-sound sensitive areas} sanitary and storm waste drainage systems, with waste temperatures below 140 degrees F.
   2. Do not install PVC piping in return air plenums or spaces used as return air plenums and as approved by the Local Authority Having Jurisdiction

D. CPVC schedule 80, ASTM D-2846, 230 psi at 73 degrees F. Solvent cement shall meet ASTM No. F-493 for chlorinated polyvinyl chloride (CPVC) plastic pipe and fittings. If permitted by governing code authority, may be used for:
   1. Inside gravity, under floor slab sanitary waste drainage systems, where temperature of waste discharged into drainage system exceeds 140 degrees F.

E. PVC schedule 40, Type-PSM, Sewer Pipe, ASTM D-3034 with SDR as gasketed slip type joints. Provide coupling with a rubber ring seal for use in each manhole entry to ensure a surface for adherence of concrete to manhole wall. If permitted by governing code authority, may be used for:
   1. Outside gravity, underground sanitary sewer drainage piping, from 5'-0" outside the building to the connections point to local municipality

F. Fittings:
   1. Permanently identify each fitting in accordance with MSS-SP-2241, and with manufacturer's trademark
   2. Include certification with submittal data that fittings and flanges meet applicable requirements

PART 3 EXECUTION

3.01 INSTALLATION

A. Clean inside of pipe before installation. Keep installed piping clean, and protect ends from foreign matter by capping or plugging them.

B. Install pipe so that it does not interfere with opening of doors or apparatus, access to equipment, or to electrical equipment.

C. Run pipes in straight lines and square with building. Install risers plumb. Make offsets only where indicated and where necessary.

D. Install branch connections using separate tee or lateral fittings for each branch. Do not combine branches into "bullhead tee" arrangement.

E. Do not install water pipes in electric rooms, tele/data rooms, transformer rooms, audio/visual rooms or elevator equipment rooms.

F. Do not install piping above electrical equipment such as starters, variable frequency drives, motor control centers, or disconnects. Maintain code required clearance above, below and to sides of electrical equipment.

G. Provide flanges or unions throughout the pipe systems at all equipment. Make provisions for servicing and removal of equipment without dismantling piping.

H. Piping Expansion:
   1. Install piping to allow thermal expansion and contraction without injury to piping, equipment or structure.
      a. Use loops or expansion joints where necessary and where detailed
      b. Provide pipe guides

I. Branch Lines:
   1. Where possible branch lines shall come off top of mains to prevent sediment, welding slag, or pipe deburrs from entering the branch lines and causing valve leakage or failure.

3.02 PIPE JOINTING

A. Preparing Pipe Ends:
   1. Machine cut pipe ends square
   2. Ream pipe ends, after cutting, to full diameter

B. Soldered and Brazed Joints:
   1. Make Type L copper pipe joints with suitable flux and 95/5, lead free solder.
   2. Make Type K copper pipe joints with silver (BAg series) brazing filler material with flux or copper-phos (BCup series) brazing filler material without flux per the recommendations of the Copper Development Association.
   3. Domestic cold and hot water piping 4" and larger shall be brazed. Copper to copper joints shall be brazed using a copper-phosphorus or copper-phosphorus-silver brazing filler metal (BCup Series) without flux. Dissimilar metals such as copper and bronze or brass shall be brazed using an appropriate flux with a silver (BAg Series) brazing filler metal.
      a. In lieu of brazing, domestic cold and hot water piping 4" and larger may be joined with rolled grooved copper fittings and valves by Victaulic or Anvil, copper pipe grooved systems.

C. Bracing Joints:
   1. Provide braces and bridle rods as required to reinforce joints.
   2. If mechanical couplings are used, then prepare pipe ends and make joints in accordance with pipe coupling manufacturer's printed instructions.
   3. Where large pipes underground are subject to shock because of sudden changes in liquid flow rate, provide concrete "kicker" blocks at joints, fittings, and changes of pipe direction. Provide "kicker" blocks in accordance with applicable pipe industry trade or research organization recommendations.
      a. For example, for ductile iron pipe follow recommendations of Ductile Iron Pipe Research Association.

3.03 ESCUTCHEONS

A. Provide chrome plated escutcheons where uninsulated pipes penetrate walls or ceilings of finished spaces.

3.04 AIR VENTING

A. Provide manually operated air vents at high points in vertical risers to eliminate air from systems.

B. Use ball valves for manual air vents.

3.05 VALVE ACCESS

A. Locate ceiling/wall access panels at shut-off and control valves for proper access and operation. Furnish and install access doors in accordance with Section 22 05 00 and other Divisions as applicable.

3.06 TESTING

A. Before piping is concealed or insulated, recheck it for leaks.

B. Rework or replace defective and leaking joints, and joints which are otherwise unsatisfactory. Preening, caulking, and doping are not permitted.

END OF SECTION

SECTION 22 11 19

DOMESTIC WATER PIPING SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes requirements for:
   1. Shock arrestors.
   2. Trap primers.
   3. Domestic water service connection.

1.02 RELATED WORK

A. Section 22 05 00: Common Work Results for Plumbing

B. Section 22 05 23: Valves for Plumbing Piping

C. Section 22 07 00: Plumbing Insulation

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are indicated in subsequent paragraphs.

2.02 SHOCK ARRESTORS

A. Acceptable manufacturers:
   1. Josam
   2. Wade
   3. Jay R. Smith
   4. Precision Products
   5. Zurn
   6. Sioux Chief

2.03 DOMESTIC WATER SERVICE CONNECTION

A. Provide tapping sleeve and valves for connection to existing water mains.

B. Provide domestic water meters, gate valves, check valves, bypass feature, and meter pit per local utility company standards.

PART 3 EXECUTION

3.01 INSTALLATION AND TESTING

A. Shock Arrestors:
   1. Install shock arrestors at each quick closing valves, solenoid type valves, and flush valves. Size shock arrestors in accordance with manufacturer's instructions.
   2. Install shock arrestors within five feet of valve, provide wall access panel as required.
   3. Test and certify shock arrestors by Plumbing and Drainage Institute.

B. Domestic Water Service Connection
   1. Arrange and coordinate with local utility company for service connection, meter type and manufacturer, fees, permits, etc.
   2. Field verify exact location, size, pressure, and elevation of existing water main.
   3. Flush system and test at 200 PSI for 24 hours without any leaks.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1- GENERAL

A. RELATED WORK

B. Section 22 05 00: Common Work Results for Plumbing

1.01 SUBMITTALS

A. Submit product data for review on piping and fittings. Submittal data shall include:
   1. Manufacturer of pipe.
   2. Tests or listing by recognized testing laboratory that certifies material composition is in accordance with ANSI/ASTM requirements.
   3. Product data for pipe and fittings to be used on each piping system.

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 CAST IRON SOIL AND VENT PIPE

A. Conform to ASTM A-74, A-888, and CISPI 301,310.

B. Standard weight pipe with drainage fittings for:
   1. Sanitary waste, vent, and drainage pipe 2" and larger above ground.
   2. Drain lines under buildings, and under exterior concrete or other paving. Extend cast iron piping at least 5 feet outside of building.

C. Joints in Cast Iron Pipe:
   1. Below grade: Bell and spigot with neoprene compression gaskets
   2. Above grade: No-Hub using stainless couplings, meeting CISPI 310-90

2.02 PVC PIPE AND FITTINGS

A. Polyvinyl chloride sewer pipe and fittings (4" to 15" diameters) shall be as manufactured by H and W Industries or equal.

B. PVC pipe, fittings, cement, and joint cleaner for entire project shall be supplied by a single manufacturer.

C. PVC schedule 40, Type I, DWV, ASTM D-2665, 1120, 160 PSI at 73 degrees F. Solvent cement shall meet ASTM No. D-2564 for (PVC-DWV) plastic and pipe fittings. If permitted by governing code authority, may be used for:
   1. Inside gravity, under floor slab sanitary and storm waste drainage systems, with waste temperatures below 140 degrees F.

D. CPVC schedule 80, ASTM D-2846, 230 psi at 73 degrees F. Solvent cement shall meet ASTM No. F-493 for chlorinated polyvinyl chloride (CPVC) plastic pipe and fittings. If permitted by governing code authority, may be used for:
   1. Inside gravity, under floor slab sanitary waste drainage systems, where temperature of waste discharged into drainage system exceeds 140 degrees F.

E. PVC schedule 40, Type-PSM, Sewer Pipe, ASTM D-3034 with SDR as gasketed slip type joints. Provide coupling with a rubber ring seal for use in each manhole entry to ensure a surface for adherence of concrete to manhole wall. If permitted by governing code authority, may be used for:
   1. Outside gravity, underground sanitary sewer drainage piping, from 5'0" outside the building to the connections point to local municipality.

F. Fittings:
   1. Permanently identify each fitting in accordance with MSS-SP-2241, and with manufacturer's trademark.
   2. Include certification with submittal data that fittings and flanges meet applicable requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. PVC Joints:
   1. Make joints in accordance with cement manufacturer's printed instructions.

B. Cast Iron Pipe Joints:
   1. Install compression gaskets and No-Hub bands in accordance with CISPI installation methods and manufacturer's instructions.

END OF SECTION

SECTION 22 13 19

SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes requirements for:
   1. Cleanouts
   2. Trap primers
   3. Sanitary sewer service connection

1.02 RELATED WORK

A. Section 22 05 00: Common Work Results for Plumbing

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are indicated in subsequent paragraphs.

2.02 CLEANOUTS

A. Acceptable manufacturers:
   1. Jay R. Smith (Jay R. Smith model numbers are used below)
   2. Josam
   3. Wade
   4. Zurn
   5. Sioux Chief
   6. Watts

B. Exterior: 4250 Series heavy duty cast iron cleanout housing with internal cleanout body and plug.

C. Finished concrete floor: 4031-PB cast iron body with round adjustable polished nickel bronze top, ABS plug and carpet marker where required.

D. Ceramic tile: 4919 PB series, cast iron body, polished nickel bronze top, 1/2" terrazzo recess and closure plug.

E. Vinyl tile floor: 4151PB series, cast iron body, round nickel bronze top, 1/8" tile recess and closure plug.

F. Carpet: 4031-PBY. Inside caulk round brass scoriated frame and cover and provide carpet marker.

G. Wall: 4422. Cast iron caulking ferrule with stainless round access cover and screws.

H. Access covers: Minimum size 12" x 12" located for access to valves, shock absorbers, trap primers, wall cleanouts, etc.

I. Furnish cleanouts occurring in waterproof floors with clamping devices.

2.03 TRAP PRIMERS

A. Acceptable manufacturers:
   1. Josam
   2. Zurn
   3. Wade
   4. Jay R. Smith
   5. Precision Plumbing Products
   6. MIFAB

B. Provide trap primer of brass construction, with removable operating parts, and integral vacuum breaker.

2.04 SANITARY SEWER SERVICE CONNECTION

A. Provide saddle, cut-in wyes, and/or connection to existing manhole per local utility company standard.

PART 3 EXECUTION

3.01 INSTALLATION AND TESTING

A. Cleanouts
   1. Provide line size cleanouts up to 4"; 4" cleanout for lines larger than 4".
   2. Locate cleanouts at all changes in direction greater than 45 degrees and in straight runs as shown 100 feet outside the building on drawing or spaced not greater than required by applicable Plumbing Code.
   3. Extend inaccessible cleanouts up through floor and/or wall to provide easy accessibility.

B. Trap Primers
   1. Install primers in accessible location or as shown on drawings.
   2. Trap primers shall be Plumbing and Drainage Institute approved.

C. Sanitary Sewer Service Connection
   1. Arrange and coordinate with local utility company for service connection, fees, permits, etc.
   2. Field verify exact location, size, and elevation of existing sewer.
   3. Flush system, fill with water and let stand with a minimum 10 feet of head for 24 hours without any leaks.

END OF SECTION

SECTION 22 33 36

WATER HEATER - ELECTRIC

PART 1- GENERAL

1.01 RELATED WORK

A. Section 22 07 00: Plumbing Insulation

B. Section 22 11 16: Domestic Water Piping

C. Division 26: Electrical

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Lochinvar

B. Bradford White

C. Hesco, Inc

D. A. O. Smith

E. State Industries

F. Rheem/Rudd

2.02 EQUIPMENT

A. Storage tank: 300 psi tested, 150 psi working pressure. ASME stamped and National Board listed. Tank lining: Vitreous glass, polymerized epoxy, or silica cement. Provide 12" x 16" manway on heater 125 gallon and larger.

B. Provide the following features:
   1. Internal fusing for control and load circuits
   2. Incoloy sheath elements
   3. ASME rated temperature and pressure relief valve
   4. Pressure and temperature gauges
   5. Terminal block wiring
   6. Rated for 180 degrees F. water temperature
   7. U.L. Listing
   8. 5 year tank warranty
   9. Element control through thermostatic or solid state step proportional sequencers

10. High density anode rods

C. Safety controls:
   1. Electronic low water cut-off
   2. High/low water pressure cut-off
   3. Fused and switched, 120 volt control circuit

D. Operating and maintenance instructions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Verify location and clearance requirements.

B. Install in accordance with manufacturer's recommendations and contract drawings.

C. Insulation for water connections as specified in Section 22 07 00.

D. Install electric connections under Division 26.

E. Clean and test unit as required by Sections 22 05 00.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with provisions of Section 22 05 00.

B. Provide plumbing fixtures, trim and related items such as supplies, traps, drains, cleanouts, water closet flanges, bolts, seats and covers, fixture supports and other accessory items.

C. Coordinate fixture requirements by reviewing architectural, structural, and equipment drawings. Install fixtures in accordance with Contract Drawings and manufacturer's rough-in drawings.

1.02 RELATED WORK

A. Section 22 13 19: Sanitary Waste Piping Specialties

B. Section 22 11 16: Domestic Water Piping

1.03 CODES AND STANDARDS

A. Perform work in accordance with applicable codes and standards enforced by local authorities.

B. All barrier free fixtures shall be installed in accordance with the Americans with Disabilities Act (ADA) Rules and Regulations.

1.04 SUBMITTALS

A. Submit manufacturer's product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Fixtures: Kohler, American Standard, Crane, Eljer, Toto.

B. Brass Trim: McGuire Engineered Brass Company, Cambridge Brass,

C. Hydrant, floor drains, shock absorbers, carriers and p-traps: Jay R. Smith, Zurn, Wade, Josam, Watts.

D. Flush valves: Flush valves: Sloan Royal, Zurn Z-6000AV with low force handles for ADA compliance.

E. Toilet seats: Olsmite, Beneke, Bemis, Church.

F. Faucets: T&S Brass, Delta HDF Water Saver, Chicago Faucet Company, Cambridge Brass, Kohler, Zurn.

G. Stainless steel sinks: Elkay, Just, Kohler.

H. Flow control devices: Dole Flow Controls Company.

I. Pre-fabricated insulation on water lines and p-trap under barrier free lavatories and sinks: Brocar Products, Inc. Inc. Trap Wrap TrueBro, Inc. Handi Lav-Guard McGuire Pro-wrap.

J. Faucets and flush valves shall meet code and state requirements for water conservation on low consumption fixtures.

K. Provide fixtures and trim as a complete unit as required in the individual "P" numbers listed below.

2.02 MATERIALS

A. Wall hung lavatories: Furnish complete with wall mounting brackets.

B. Countertop sinks: Furnished complete with mounting rings where required.

C. Fixture color: White unless specified otherwise.

D. Faucets and flush valves: Provide either integral or attached supply stops with nipples.

E. Clamping device: Provide for drains installed in slabs above grade.

F. Trap primer: Provide connections for floor drain as shown on drawings.

G. Caulking: General Electric silicon sanitary sealant or equal.

H. Provide Zurn ZR-1231 floor mounted carrier for wall hung lavatories.

I. Provide FRT wood or metal backing at wall fixtures and fixture trim connections so piping and connecting faucets and valves are rigid to wall.

J. Wrist blade operation:
   1. Pull wrist blade to operator to turn on
   2. Push toward splashback to turn off faucet

K. All fixtures and fittings relating to drinking water shall meet the requirement of ANSI/NSF 61, Section 9. Any faucet for drinking water shall be certified by U.L. to the ANSI/NSF 61, Section 9 standards.

2.03 PLUMBING FIXTURES

P-1 WATER CLOSET (FLOOR MOUNTED-FLUSH VALVE (1.6 GPF)
   a. Fixture: K-4350 white elongated bowl

b. Valve: Sloan #111YB 1.6 gallon per flush
c. Trim: Two bolt caps included
d. Seat: Kohler K-4620-C white open front

P-2 WATER CLOSET (FLOOR MOUNTED-FLUSH VALVE - BARRIER FREE - 1.6 GPF)
a. Fixture: Kohler #K-4368, white elongated bowl
b. Valve: Sloan #111YB, 1.6 gallon per flush
c. Seat: Kohler K-4670 white open front
d. Trim: Two bolt caps included

P-3 URINAL (WALL HUNG-FLUSH VALVE)
a. Fixture: Kohler K4960-T, White, elongated rim
b. Valve: Sloan Royal 186-1-YBYC
c. Mounting: 24 inches from finished floor to flood rim

P-4 URINAL (WALL HUNG-FLUSH VALVE-BARRIER FREE)
a. Fixture: Kohler K-5016-T, White, elongated rim
b. Valve: Sloan Royal 180-1-YBYC
c. Mounting: 17 inches from finished floor to flood rim

P-5 LAVATORY (OVAL-DROP IN-SINGLE LEVER)
a. Fixture: Kohler K-2196-4, 20 inches by 17 inches
b. Faucet: Kohler K-15592-5 with McGuire 155-A grid drain
c. Trim: McGuire 2165 supplies with wheel handle stops. One McGuire 8872 1-1/4 inch semi-cast brass P-trap

P-6 LAVATORY (OVAL-DROP IN-OVAL-SINGLE LEVER-BARRIER FREE)
a. Fixture: Kohler K-2196-4, 20"x17"
b. Faucet: Kohler K-15593-5
c. Trim: One McGuire 155-WC 1-1/4 inch grid drain and tailpiece. McGuire 2165 supplies with wheel handle stops. One McGuire 8872 1-1/4 inch semi-cast brass P-trap
d. Mounting: See Architectural Drawings for counter height. Insulate hot water piping and P-trap under sink. Install 5" from counter front to edge of lavatory for ADA compliance

P-7 SINK (S.S. SINGLE COMPARTMENT)
a. Fixture: Just SLX-2017-A-GR, 20"x17"x10.5"
b. Faucet: Kohler K-15171, single lever faucet with K-18036 aerator
c. Trim: One McGuire 151 drain with 1-1/2 inch tailpiece. McGuire 2165 supplies with wheel handle stops. One McGuire 8912 1-1/2 inch by 1-1/2 inch semi-cast brass P-trap

P-8 JANITORS FLOOR BASIN
a. Fixture: Stein-Williams terrazzo SB-900, 24"x24"x12" with stainless steel cap, less tiling flanges
b. Faucet: T. & S. B-695 with vacuum breaker.
c. Mounting: Mount faucet 36 inches above finished floor. Mount vacuum breaker 7 feet 6 inches above finished floor

P-9 SHOCK ABSORBER
- a. Fixture: Jay R. Smith 5005 through 5050 size as recommended by manufacturer

P-10 WATER COOLER FOUNTAIN (WALL HUNG - BARRIER FREE)
- a. Fixture: Sunroc HCWC-8-SS with stainless steel apron
- b. Trim: One McGuire 2165 supply with wheel handle stop. One McGuire 8872 1-1/4 inch semi-cast brass P-trap
- c. Capacity: 8 GPH at 90 degree room temperature
- d. Mounting: 36 inches from bubbler to finished floor

P-11 FLOOR DRAIN (REGULAR-GENERAL PURPOSE)
- a. Fixture: Jay R. Smith 2005-A-B cast iron floor with sediment bucket and polished nickel bronze top, adjustable, strainer and flashing clamp device. Size of drain as shown on drawings.

P-12 FLOOR DRAIN (EQUIPMENT ROOMS)
- a. Fixture: Jay R. Smith 2233 round, cast iron, 12" diameter drain with sediment bucket, flange and clamp device. Size of drain as shown on drawings.

P-13 TRAP PRIMER (FLOOR DRAIN CONNECTION)
- a. Fixture: Precision Plumbing Products Model P-1 and P-2, sized as required for the number of floor drains served, with trap primer valve and distribution unit.

P-14 WALL HYDRANT (NON-FREEZE, KEY OPERATED)
- a. Fixture: Jay R. Smith #5609-NB "line-gard", anti-siphon non-freeze wall hydrant, cast brass, nickel bronze face, with integral vacuum breaker. Mounting: 18" from center line of hydrant to finished grade.

P-15 HOSE BIBB (COLD WATER - EQUIPMENT ROOMS)
- a. Fixture: Woodford #24P-1/2 with vacuum breaker, rough brass finish.

PART 3 EXECUTION

3.01 INSTALLATION

A. Connect to plumbing fixtures and equipment provided under this and other sections of specification, architectural drawings, and manufacturer's shop drawings. Provide rough-in connections as shown on drawings.

B. Use schedule and details on drawings or manufacturer's shop drawings for connection sizes to fixtures.

C. Connect wall hung urinals to waste piping with red brass nipples.

D. Provide separate p-trap for each fixture, floor drain, and piece of equipment.

E. Provide cast iron p-traps under floor drains.

F. Install barrier free fixtures in accordance with rules and regulations of the Americans with Disabilities Act (ADA).

G. Provide outlet devices which limit the flow of hot water to lavatories and sinks to a minimum of 0.5 GPM, sized as recommended by the manufacturer and as required under ASHRAE Standard 90-75, paragraph 7.7.2 or local or state energy codes.

H. Install lavatories and sinks with a minimum of 4" clearance on each side, from a wall or partition.

I. Install water closets with a minimum of 15" clearance from the centerline of the bowl to each side, from a wall, partition, divider, or another fixture.

J. Water closets shall have a minimum of 21" clearance in front of bowl.

K. Coordinate dimensions required for minimum fixture clearances with other Divisions.

L. Add trap primer connection to floor drain if required. (See drawing for requirement)

M. Caulk around joints at fixtures mounted on wall or floor, or backed up to walls.

N. Mount fixtures rigid to walls as shown on drawings or details.

O. Flush valves: Install flush valves on wide side of water closet as required for ADA accessibility.

P. Run connection size cold water line to back of refrigerator and connect with cutoff valve at connection point. Field verify exact connections required.

3.02 TESTING AND CLEANING

A. Inspect and test all work to insure that it is installed in accordance with drawings and specification and is functioning as designed. Test procedures and pressure as required by other sections.

B. Correct all deficiencies found and retest.

C. Turn all work over to Owner in a clean, sanitary condition.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic materials and methods, along with Division 01, General Requirements, that are applicable to Division 26 sections.

B. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 specification Sections apply to all Division 26 sections.

1.02 QUALITY ASSURANCE

A. Comply with applicable local, state, and federal codes.

B. Warrant electrical Work against faulty material or Workmanship in accordance with Division 01. If the Project is occupied or the systems placed in operation in several phases at the request of the Owner's Representative, then the warranty of each system or piece of equipment used, shall begin on the date each system or piece of equipment was placed in satisfactory operation and accepted as such, in writing, by the Owner's Representative. The use of building equipment for temporary service and testing does not constitute the beginning of the warranty.

C. Equipment and material provided under this Division shall be periodically inspected and serviced by competent mechanics. This function becomes the responsibility of the Owner's Representative when the system is accepted by the Owner's Representative. The one year material and Workmanship warranty is not intended to supplant normal inspection or service and shall not be construed to mean the Contractor shall provide free service for normal maintenance items such as periodic lubrication and adjustment due to normal use, nor to correct without charge, breakage, maladjustment, and other trouble caused by improper maintenance.

D. Turn over electrical equipment provided under this Division to the Owner's Representative in lubricated condition. Include instructions on further lubrication in the operating manual.

E. Upon completion of contract and progressively as work proceeds, clean-up and remove dirt, debris and scrap materials. Maintain premises neat and clean. Protect and preserve access to energized equipment at all times. Clean items with factory finishes. Touch-up minor damage to surfaces; refinish entire piece of equipment when sustained major damage. Use only factory supplied paints of matching color and formula. Schedule an off-hour shutdown of all electrical equipment during the 2-week period preceding substantial completion. During this shut down, clean all buses and insulators inside all switchgear, switchboards, bus ducts, collector buses and panelboards located inside or adjacent to the project limits.

1.03 REGULATORY REQUIREMENTS

A. Perform Work specified in Division 26 in accordance with standards listed below of the latest applicable edition adopted by the authority having jurisdiction. Where these Specifications are more stringent, they shall take precedence. In case of conflict, obtain a decision from the Architect,.
   1. NFPA-70: National Electrical Code
   2. NFPA-72: National Fire Alarm Code
   3. NFPA 90A: Standard for the Installation of Air Conditioning and Ventilating Systems
   4. NFPA 90B: Standard for the Installation of Warm Air Heating and Air Conditioning Systems
   5. NFPA 92A: Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences
   6. NFPA-101: Life Safety Code
   7. NFPA 241: Standard for Safeguarding Building Construction, Alterations, and Demolition Operations
   8. NFPA-780: Standard for the Installation of Lightning Protection Systems
   9. NFPA 5000: Building Construction and Safety Code
   10. ANSI Handicapped Code-A117.1
   11. UL White Book: General information for electrical construction, hazardous location, and electrical heating and air conditioning equipment
   12. International Building Code
   13. State of Tennessee Electrical Code (with all local amendments)
   14. All applicable Occupational Safety and Health Administration (0SHA) Publications, Rules and Regulations.
   15. Americans with Disabilities Act (ADA).

1.04 RELATED WORK SPECIFIED UNDER OTHER DIVISIONS

A. Foundations and pads required for equipment furnished under this Division

B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting

C. Flashing of conduits into roofing and outside walls

D. Heating, ventilating, and air conditioning equipment

E. Plumbing equipment

F. Fireproofing

G. Automatic Doors

H. Cutting and patching for electrical Work, except for errors and omissions under this Division.

1.05 RELATED WORK - OWNER FURNISHED EQUIPMENT AND SYSTEMS

A. Security System Equipment

B. Data Processing System Equipment

1.06 SUBMITTALS

A. Comply with provisions of Division 01.

B. Submit product data, equipment details, capacities, and shop drawings as specified in sections of this Division.

C. Submit fire alarm point-to-point drawings with product data submission.

D. Submit dimensioned equipment room layouts.
   1. Show location of all electrical equipment in rooms including but not limited to:
      a. Electrical rooms and closets
      b. Mechanical Rooms
   2. Draw room layouts to 1/4" scale, with equipment locations shown therein. Clearances shall be in accordance with NEC and local codes. Indicate on drawing the mechanical equipment and mechanical and sprinkler pipe routing.
   3. Electrical equipment submittals will be rejected without dimensioned equipment room or equipment location layouts.

1.07 OPERATING AND MAINTENANCE MANUALS

A. Provide manuals in accordance with Division 01.

B. In addition to required submittals, include copies of all test reports required in Part 3, "Execution" of section 26 05 00.

C. Provide completed warranty certificates for systems and equipment.

D. Provide tabulation of overload heaters, including each motor identified, nameplate data and o/l heater part number.

1.08 DELIVERY AND STORAGE

A. Insofar as possible, deliver items in manufacturer's original unopened packaging. Where this is not practical, cover items with protective materials to keep them from being damaged. Use care in loading, transporting, unloading, and storage to keep items from being damaged.

B. Store items in a clean dry place and protect from damage. Evidence of damage from water or other contaminants will be cause for rejection.

1.09 RECORD DRAWINGS

A. Comply with provisions of Division 01.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Equipment and materials furnished shall be listed by UL or other nationally accredited testing laboratory where available. When listing is not available for a piece of equipment, it shall be submitted in accordance with Drawings and Specifications and shall be approved by the authorities having jurisdiction.

B. Specifications and Drawings indicate name, type and/or catalog number of materials and equipment to establish standards of quality. Submittals shall be based on the standards specified. The standards should not be construed as limiting competition.

C. If materials and equipment other than specified herein are intended to be submitted, a letter providing a list of all the suggested alternates by section number, brand and series or model shall be submitted to the prime Architect for review and approval. Submit in accordance with Division 01 or 14 days prior to bids or final pricing are to be submitted.

2.02 FUSES

A. Provide fuses as scheduled on Drawings for switchboards, power panelboards and disconnecting switches.

B. Acceptable manufacturers: Bussmann; Gould Shawmut; Littelfuse, Inc

C. Provide fuses of one manufacturer only. Place the same type fuse in each pole of a switch.

D. Use these types:
   1. Class J-Time Delay-1A-600A; Switchboards, motor loads
   2. Class J-Fast Acting-1A-600A; Switchboards, other loads
   3. Class RK5-Time Delay-1/10A-600A; Power panels and fusible switches, motor loads
   4. Class RK1-Fast Acting-1A-600A; Power panels and fusible switches, other loads

E. Provide a manufactured fuse storage cabinet, mounted on wall in main electrical room, complete with one set (3 fuses) of spare fuses for each type and rating installed in this Project.

2.03 WALL AND CEILING ACCESS PANELS

A. Style and type as required for material in which installed.
   1. Size: 16" X 16" minimum, as indicated, or as required to allow inspection, service and removal of items served
   2. 14 gauge minimum sheet metal for doors, 16 gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction
   3. Panels shall have spring hinges with screwdriver locks in non-public areas. Key lock, keyed alike, for panels in public areas
   4. Prime painted or rust inhibitive paint finish
   5. UL labeled when in fire-rated construction, 1 1/2 hour rating

6. Provide in walls, floors, and ceilings to permit access to all equipment and junction boxes.
7. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.
8. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers. Use panels equal to Milcor Style M for masonry and drywall construction; equal to Milcor Style K for plastered masonry walls and ceilings. Stainless steel panels shall be used in ceramic tile or glazed structural tile

PART 3 EXECUTION

3.01 COORDINATION

A. Install equipment in accordance with manufacturer's recommendations. Where conflicts occur between Contract Documents and these recommendations, request a ruling before proceeding with such Work.

B. Visit site and observe conditions under which work must be performed. No subsequent allowance will be made because of error or failure to obtain necessary information to completely estimate and perform work required by these documents.

C. Examine Specifications and Drawings to be familiar with items which require electrical connections and coordination. Electrical Drawings are diagrammatic and shall not be scaled for exact sizes.

D. Prior to commencement of installation, prepare coordination drawings for work under this division, as specified in Division 01 and as called for herein. Coordinate work in full cooperation with persons performing work under other divisions, including but not limited to mechanical, plumbing, fire protection, telecommunication and miscellaneous steel to develop these coordination drawings that will serve as the agreed upon plan for a coordinated installation of work for all trades. Include electrical equipment, switchgear, panelboards, starters, disconnect switches, cable tray, conduit racks and conduits 3" and larger on drawings confirming coordination with other trades. Incorporate the information onto the coordination drawings required under Division 01 and 23 to develop master coordination drawings. Account for lighting fixture depths in the coordination. Inform Design Professional of conflicts that cannot be resolved.

E. Drawings are not to be submitted to Engineer. Submit a copy to the General Contractor and keep a copy on site for references. Notify design professional of conflicts that cannot be resolved.

3.02 FEES AND PERMITS

A. Obtain and pay for all necessary permits and inspection fees required for electrical installation.

3.03 TEMPORARY LIGHTS AND POWER

A. Comply with provisions of Division 01.

B. Provide a temporary electrical lighting and power distribution system of adequate size to properly serve the following requirements, including adequate feeder sizes to prevent excessive voltage drop. Temporary Work shall be installed in a neat and safe manner in accordance with the National Electrical Code, Article 305, NFPA 241, and as required by OSHA or applicable local safety codes.

C. Provide one pigtail socket with 150 watt lamp, CFL medium base, for every 1,000 square feet of floor area, evenly distributed throughout the building and with minimum of one pigtail socket per room.

D. Provide suitable guards for temporary lights to prevent accidental contact with lamps.

E. Provide a minimum of one GFCI-protected duplex power outlet for every 1,500 square feet of floor area, evenly distributed throughout the building. Power outlets shall be GFCI-protected duplex 20 amp, 120 volt.

F. Provide feeders, disconnects, connections, etc., required for construction equipment, e.g.: cranes, pumps, etc.

G. Prior to installation, determine if any lighting or power outlets over the minimum quantity noted above are required and if so, provide them.

H. Provide service and panelboards required for above lighting and power outlets.

I. Requirement for payment of utility bills during construction are specified in Division 01.

J. Provide single phase and three phase service as required by Project.

K. Remove temporary wiring upon completion of use.

3.04 CUTTING AND PATCHING

A. Comply with provisions of Division 01

B. Repair or replace routine damage caused by cutting in performance of Work under this Division.

C. Correct unnecessary damage caused due to installation of electrical Work, brought about through carelessness or lack of coordination.

D. Holes cut through floor slabs shall be core drilled with drill designed for this purpose. All openings, sleeves, and holes in slabs between floors shall be properly sealed, fire proofed and water proofed.

E. Holes cut through walls shall be drilled or cut with tools designed for the purpose. All openings, sleeves and holes in walls that extend to underside of floor above shall be properly sealed and fire proofed.

F. Repairs shall be performed with materials which match existing materials and be installed in accordance with appropriate sections of these Specifications.

G. Contractor shall not be permitted to cut or modify any structural members without the written permission of the Architect.

3.05 TRENCHING, EXCAVATION, BACKFILLING, AND REPAIRS

A. Comply with provisions of Division 31.

B. Provide trenching, excavation, and backfilling necessary for performance of Work under this Division.

C. Provide sheathing, shoring, dewatering, and cleaning necessary to keep trenches and their grades in proper condition for Work to be performed.

D. Trenching and excavation shall be unclassified. No extra will be paid in event that rock is encountered.

3.06 FOUNDATIONS AND PADS

A. Provide concrete foundations and pads for equipment per the requirements Division 03. Locate and size foundations, pads, and anchor bolts as required for equipment in this Division.

B. Provide concrete foundations and pads as required for electrical utility company's equipment such as transformers, CT cabinets, metering cabinets, switches, fused disconnects, and circuit breakers. All work shall be in compliance with the utility company's specifications.

3.07 CONTROL SYSTEMS AND INTERLOCK WIRING

A. Control systems, components and control and interlock wiring for mechanical equipment will be furnished under Divisions 22 and 23. Control devices including, but not limited to VFD's, thermostats, fan speed and level control switches, relays and electro-pneumatic switches shall be furnished under Divisions 22 and 23.

B. Provide magnetic starters per section 26 29 13.

C. Provide manual motor starters per Section 26 29 13.

D. Provide power wiring to starters and contactors under Division 26. Power wiring to magnetic starters shall consist of wiring to the line side terminals of the magnetic starter or contactor and wiring away from the load side terminals to the equipment, except where such wiring is installed pre-wired by the equipment vendor.
   1. Power wiring to 120V, 1-phase, 60 Hz and 277V, 1-phase, 60 Hz volt fans, unit heaters, fan-coil units and pumps shall include all portions of the branch circuit, except wiring inside an automatic temperature control panel (ATC) or Direct Digital Control Panel (DDC) or magnetic starter. Such internal wiring shall be furnished under Divisions 22 & 23.

E. Under Division 28:
   1. Furnish duct mounted smoke detectors.

2. Provide wiring among detectors, fire alarm system, magnetic starters and relays, ATC panels and DDC panels

F. See Building Automation System sections of Division 23.

3.08 UTILITY COMPANY COORDINATION

A. Coordinate with the serving utility company as to all types of work required to be done by the contractor for utility equipment.

B. Confirm exact location of point of common coupling, duct banks, pads, etc.

C. Obtain copies of all pertinent utility company specifications relating to duct banks, concrete pads, raceways, and cable that are contractor installed for the utility company use. Maintain copies at project site.

D. Install at components in compliance with utility company specifications and project specifications.

3.09 TESTING ELECTRICAL SYSTEMS

A. On completion of work, installation shall be completely operational and entirely free from grounds, short circuits, and open circuits. Perform operational tests as required to demonstrate substantial completion of the Work. Balance circuits so that feeders to panels are not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests. All ampere readings shall be made with a true RMS reading meter.

B. Perform megger tests of all service entrance circuits, feeder and branch circuits size #4 AWG and larger. Provide a report of all such megger test results.

C. Furnish the DESIGN PROFESSIONAL a copy of test reports and required certification including but not limited to the following:
1. Service ground resistance test
2. Switchboard and panelboard load test - include ampere readings of all panels and major circuit breakers
3. Ground Fault Test
4. Fire Alarm System Certification
5. Megger test results
6. Power System Analysis Report

D. Prior to final observation and acceptance test, install all electrical systems and equipment complete and in satisfactory operating condition.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide a complete system of conductors for lighting, power, and systems throughout the project.

1.02 RELATED WORK

A. Section 26 05 33: Raceways and Boxes for Electrical Systems

B. Section 26 05 43: Underground Ducts and Raceways for Electrical Systems

1.03 REFERENCES

A. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

B. ANSI/UL 83 - Thermoplastic-Insulated Wire and Cables

C. NFPA 70 - National Electrical Code, latest edition

1.04 SUBMITTALS

A. Submit the data sheets for products furnished under this Section.

1.05 DELIVERY, STORAGE AND HANDLING

A. Provide factory-wrapped waterproof flexible barrier material for covering wire and cable wood reels, where applicable, and weather resistant fiberboard containers for factory packaging of cable, wire and connectors, to protect against physical damage in transit. Damaged cable, wire or connectors shall be removed from project site.

B. In their factory-furnished coverings, store cable, wire and connectors in a clean, dry indoor space, which provides protection against the weather.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. American Insulated Wire

B. United Copper

C. Encore

D. Republic Wire

E. Southwire

F. Superior Essex

G. Cerrowire

2.02 CONDUCTORS

A. Provide 98% conductivity copper conductors with 600V insulation.

B. For conductors No. 12 AWG and No. 10 AWG, provide solid type THWN or THHN.

C. For conductors No. 14 AWG and smaller, provide solid type THHN.

D. For conductors No. 8 AWG and larger, provide stranded type THHN, or THWN applied consistently with insulation ratings and NEC requirements.

E. Provide white or gray colored neutral conductors; provide color coded phase conductors.

F. Minimum conductor size shall be:
   1. #12 for power wiring
   2. #14 for hard wired controls unless otherwise specified

G. Fire alarm wire and cable shall meet the requirements of NFPA 70, Article 760. Where required by code and other sections of the specification, fire alarm wire and cable shall be UL listed as Fire Alarm Circuit Integrity Cable (CI Cable).

H. Provide digital communication, network cabling, and other low voltage systems wiring as directed elsewhere in this specification.

PART 3 EXECUTION

3.01 INSTALLATION

A. Conductors shall be continuous from origin to panel or equipment termination without splices. Where splices and taps are necessary or required, they shall be made in splice boxes.

B. Install pull boxes in circuits or feeders over 100' long.

C. Make splices and connections only in outlet, pull or junction boxes. Twist conductors together before installing wire nuts or connectors.

D. Use powdered soapstone or pulling compound to pull conductors.

E. Deliver conductors to jobsite new and in original wrapping, package or reel.

F. Conductors and connections shall test free of grounds, shorts, and opens.

G. Provide No. 10 wire in lieu of No. 12 wire for any branch circuit in excess of 100 feet (120V) or 150 feet (277V) of circuit length to farthest device to prevent excessive voltage drop.

H. Use Ideal wire nuts, Scotchlok Type Y, R, G, or B connectors for fixture connections at outlet boxes.

I. Make feeder taps and joints with approved compression sleeves. Insulate sleeves with heat shrink tubing, rated 600V, 90 degree C., containing factory applied sealant.

J. Leave a minimum of 8" slack wire in every outlet box whether it be in use or left for future use.

K. Color code conductors as follows:
   1. 120/208 Volt Systems:
      a. Phase A - Black
      b. Phase B - Red
      c. Phase C - Blue
      d. Neutral - White
      e. Ground - Green
      f. Isolated Ground - Green with Yellow stripe
   2. 277/480 Volt Systems:
      a. Phase A - Brown
      b. Phase B - Orange
      c. Phase B - Purple
      d. Phase C - Yellow
      e. Neutral - Gray
      f. Ground - Green

L. Use factory color coded conductors where commercially available. If not available, use black conductors and band with color tape.

M. Install in each branch-circuit panelboard a legend explaining color code for ungrounded conductors.

N. Complete conduit system, including bushings, before pulling wire and cable.

O. Maintain separation of electric light, power, Class 1, 2 and 3 wiring throughout raceway systems. Comply with requirements of NFPA-70, paragraphs 300-3, 725-15 and 725-54.

3.02 FIELD TESTING

A. Visually check wire, cable, and connectors for physical damage and proper installation.

B. Check continuity of wire and cable using a low voltage DC tester.

C. Check for proper torque on all mechanical connections.

D. Perform a 1000 VDC megger test on all 600 volt insulated wire or cable #4 AWG and larger. Check each wire to ground and to all other wires in the same cable or conduit by

connecting each wire not under test together and to ground. Wire or cable shall be disconnected at each end and protected from current leakage during testing.

1. Service entrance circuits and feeder (600A & smaller) circuits and branch circuits
    a. Use either a motor driven (Biddle 359) or a hand crank (Biddle MJ159) megger
    b. Perform a dielectric absorption ratio test using a 60-second test period. Record the megohm readings at 30 seconds and 60 seconds. Calculate the dielectric absorption ratio (60 sec / 30 sec readings) and record

E. Provide 8 copies of the megger test report to the Engineer. The report shall be in a tabulated format and shall include the following as a minimum.
    1. Circuit identification
    2. Type of raceway
    3. Approximate length of circuit
    4. Megohm readings
    5. Polarization index or dielectric absorption ratio
    6. Ambient temperature
    7. Approximate humidity (dry, average, or humid)

F. Results
    1. Acceptable
        a. Megohms greater than (1.6 x 1000 / length)
        b. Polarization index greater than 2.0 or a dielectric absorption ratio greater than 1.4
    2. Questionable (must be discussed with Engineer)
        a. Polarization index 1.0 less than 2.0 or a dielectric absorption ration 1.0 less than 1.4
    3. Unacceptable (wire or cable must be replaced)
        a. Megohms less than (1.6 x 1000 / length)
        b. Polarization index less than 1.0 or a dielectric absorption ration less than 1.0

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. The entire system of raceways and equipment shall be grounded in accordance with Articles 250 and 517 of the National Electrical Code and any local regulation or governing authority.

1.02 SUBMITTALS

A. Submittals are not required for products in this Section.

PART 2 PRODUCTS

2.01 REQUIREMENTS

A. Ground clamps: OZ Electrical Manufacturing Company Type "CG", or equal by Steel City or Appleton.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. General
   1. Clean all conductive surfaces on equipment to be grounded, to assure good electrical continuity.
   2. Effectively bond all grounding conductors to grounding electrodes, equipment enclosures and ground buses.
   3. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.
   4. All conduits shall have separate ground wire installed in accordance with Table 250.122 of the National Electrical Code.

B. Service Equipment/Building Ground:
   1. Bond service equipment to incoming main water line with heavy duty ground clamp in accordance with Article 250.50 of National Electrical Code. Size bonding conductor in accordance with Table 250.66 of National Electrical Code unless larger conductor is indicated on the drawings. Utilize insulated bonding conductor.
   2. Building steel shall be connected to ground bus on main service with a conductor the same as specified above.
   3. The system grounds shall be installed and connected as follows: Lay two 500 MCM bare copper conductors in the footing under one wall of the electrical

equipment room. The two conductors shall be continuous in the footing for a minimum of 25 feet. Connect the grounding conductors to ground bus in service entrance section of main switchboard.

4. Grounding electrode conductors specified herein shall be installed without conduit, in general. Where exposed to potential physical damage, install the conductor in Schedule 80 PVC.

C. Feeder/Branch Circuits:
   1. Provide a separate green grounding conductor in the conduit of feeder circuits for the following equipment, sized in accordance with Table 250.122 of the National Electrical Code:
      a. Panelboards
      b. Switchboards
   2. Install a separate green grounding conductor in same conduit as phase and neutral conductor from panel ground bus to device for branch circuits. Install an equal number of grounding and neutral conductors. Size the grounding conductor in accordance with Table 250.122 of the National Electrical Code.
   3. Bond the receptacle ground pin to its box using a bonding jumper, except where isolated ground receptacles are required.
   4. Flexible conduit will not be approved as a grounding means. Flexible conduit shall have a jumper wire sized to ampacity of branch breaker and connected to conduit system on both ends. This applies to fixtures, motors, controls and other devices.

D. Transformers:
   1. Provide a copper bonding jumper to ground the secondary neutral of transformers. Provide a grounding electrode conductor (sized in accordance with National Electrical Code Table 250.66 for the derived phase conductors) to bond the secondary ground of the transformer to the grounding electrode system including the grounding conductor of the primary feeder, the building steel and a cold water main, 1-1/2 inch or larger. Bond across any dielectric unions between point of connection and domestic water entrance.
   2. Main telephone service equipment grounding means shall include but not be limited to a No. 4 AWG, green, insulated, copper grounding conductor connected to the main electrical service equipment ground bus. Terminate this conductor at the telephone equipment location with an ILSCO NB-350-42-R16 grounding bus mounted on the plywood backboard.

3.02 TEST

A. Ground on main service shall be tested using test equipment similar to a "Biddle" tester. Test data shall be submitted to Owner for approval and such approved test data shall become a part of the Operating and Maintenance Instruction Manual. In no event shall ground resistance exceed 25 OHMS. Additional rods or other means shall be employed when measured resistance exceeds 10 OHMS.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide a system of supporting devices and hangers for support or bracing of conduit, electrical equipment, including safety switches, fixtures, panelboards, outlet boxes, junction boxes, and cabinets.

1.02 RELATED WORK

A. Section 26 05 33: Raceways and Conduit Systems

B. Section 26 05 34: Pull and Junction Boxes

C. Section 26 05 35: Outlet Boxes

1.03 SUBMITTALS

A. Submittals are not required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Erico Products, Inc

B. Steel City

C. Minerallac

D. Rayco Fasteners

2.02 TYPES OF SUPPORTING DEVICES

A. Provide appropriate supporting means as detailed on Drawings.

B. Unless otherwise directed in Specifications or Drawings, provide appropriate supporting devices and hangers for electrical equipment from this list of Caddy fasteners:
   1. "Z" purlin clips - 1-1/4" maximum conduit
   2. Conduit clips - 2" maximum conduit
   3. Beam clamps (rod hanger clamps and vertical flange clamps) for support of threaded rods
   4. Beam clamps (set screw type) - 2" maximum conduit

5. Beam clamps (universal) for support of boxes and combination conduit hanger clamps
6. Combination push-in conduit clips - 1" maximum conduit
7. Combination conduit hanger clamps - 2" maximum conduit
8. Flexible conduit clips - 1" maximum flexible conduit
9. Special combination conduit clips - 1" maximum conduit
10. One hole steel straps
11. Conduit hangers - 4" maximum conduit
12. Combination box/conduit hangers for supporting conduit within 3'-0" of a box are not acceptable

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Secure conduits to within 3 feet of each outlet box, junction box, cabinet and fitting and at intervals not to exceed ten feet in accordance with current edition of the National Electrical Code.

B. Install clamps secured to structure for feeder and other conduits routed against the structure. Use drop rods and hangers to support conduits run apart from the structure.

C. Provide and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures and panelboards.

D. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. (Prepainted or galvanized support material is not required to be painted or repainted.)

E. Use of chains, perforated iron, baling wire, or tie wire for supporting conduit runs will not be permitted.

F. Use of Caddy clips to support conduit to top of t-bar ceiling grid will not be permitted.

G. For support of low voltage wiring not required to be in conduit, Contractor shall bundle cables together in a neat manner using approved nylon tie wraps. Bundled cables shall be supported with "J" hooks on telephone type bridle rings, a minimum of six feet on centers.
   1. Use UL listed Ty-wraps for plenum use in plenum areas.
   2. Maximum supported weight rating of "J" hooks shall not be exceeded.
   3. Identify differing types of cables and tag them with tape indicating service, i.e. telephone, nurse call and dictation.
   4. Identification tape shall be provided at minimum intervals of 25 feet on center and within each individual space.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND CONDUIT SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide a complete conduit system with associated couplings, connectors, and fittings.

1.02 RELATED WORK

A. Section 26 05 29: Hangers and Supports for Electrical Systems

1.03 SUBMITTALS

A. Submittal of products furnished under this Section are not required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. EMT, IMC, and Rigid conduit shall be hot dipped, galvanized, or electro galvanized steel by Allied, General Electric, Republic, Triangle, or Wheatland.

B. PVC conduit shall be Carlon, Schedule 40 or Schedule 80, 90 degrees rated.

C. Associated couplings, connectors and fittings shall be steel as manufactured by Raco or equivalent.

D. Erickson couplings shall be used where neither length of conduit can be rotated.

E. EMT box connectors and couplings shall be compression type.

F. Conduit, connectors, couplings and fittings shall be UL listed and labeled.

2.02 ELECTRICAL METALLIC TUBING (EMT)

A. Use Electric Metallic Tubing (EMT) where drawings call for conduit to be:
   1. Concealed in walls
   2. Installed above suspended ceilings
   3. Installed exposed, above 6 feet

2.03 INTERMEDIATE METAL CONDUIT (IMC)

A. Use Intermediate Metal Conduit (IMC) where drawings call for conduit to be:
   1. Installed for feeders
   2. Installed in hazardous areas

3. Installed in concrete slabs on grade to serve floor boxes, freestanding casework, etc
4. Installed exposed below 6 feet
5. Installed in wet locations

2.04 RIGID STEEL CONDUIT (RSC)

A. Use rigid steel conduit where drawings call for conduit to be:
1. Installed underground
2. For feeders
3. Exposed to severe mechanical damage

2.05 POLYVINYL CHLORIDE (PVC)

A. Use PVC for:
1. Underground service entrance conduits for power
2. Underground service entrance conduits for telephone
3. Exterior branch circuits installed underground
4. Concrete encased ductbanks

2.06 FLEXIBLE METAL CONDUIT

A. Provide flexible metal conduit for termination at equipment subject to motion and vibration.

B. Conduit shall be electrically continuous from outlet or conduit end to utilization equipment.

C. Length shall not exceed 6 feet.

D. Maximum length concealed in walls shall be 3 feet.

E. Where exposed to continuous or intermittent moisture, conduit shall be liquid tight.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Minimum size of conduits shall be 3/4"

B. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors and fittings.

C. Make bends or offsets with standard ells or field bends with an approved bender.

D. Run concealed conduits in direct line with long sweep bends or offsets. Run exposed conduits parallel to and at right angles to building lines. Group multiple conduit runs in banks.

E. Conduit systems shall be electrically continuous.

F. Secure conduits to boxes and cabinets with double locknuts and bushings.

G. Cap ends of conduits to prevent entrance of water and other foreign material during construction.

H. Complete conduit systems before pulling conductors.

I. Support conduits as specified in Section 26 05 29 and in accordance with National Electrical Code.

J. Provide cable supports in conduits rising vertically in accordance with the National Electrical Code, Article 300.

K. Provide insulated bushing on both ends of empty conduits.

L. Conduits which pass through floor slabs (except ground floor) shall be sealed with UL listed fire-stopping materials. Seal around conduits or other wiring materials passing through partitions, which extend to the underside of the slab above, and those passing through smoke partitions and fire rated walls. Use U.L. listed materials to prevent passage of smoke or fire. See Division 7 for specific materials required.

M. Conduits which enter crawl spaces, tunnels, and basements from outside the building shall be grouted-in to prevent entry of gases, vapors, insects or rodents to these spaces from street mains.

N. When four or more, 2 inch or larger conduits, are banked together below the ground floor slab they shall be supported and separated using Carlon, Snap-Loc type spacers. Backfill below, between, and above ducts in such a manner to prevent erosion and restore sub-grade preparation prior to concrete slab pour.

O. Where IMC or RSC conduit is installed in a cabinet, junction box, pull box or auxiliary gutter, conductors shall be protected by insulated bushings. Locknuts shall be installed on conduit outside and inside enclosure.

P. Install seal-off fittings in conduits entering hazardous areas and conduits entering cold temperature areas, such as freezers and refrigerators.

Q. Use expansion fittings or flexible conduit, properly bonded, to ensure ground continuity across expansion joints in floors and ceilings.

R. Terminate conduits for feeders and branch circuits directly into panelboard enclosures from which they are served without the use of pull boxes, junction boxes, wire ways, or auxiliary gutters. If the panelboard enclosure does not provide sufficient surface area for all conduits, notify the Engineer and request directions.

S. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit, and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.

T. Conduits shall be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.

U. Where feeder or branch conduits enter pull boxes or junction boxes, clearly mark on conduit on the entering and leaving side of each box the panel name and circuit number(s) contained within the conduit using a permanent black marker.

3.02 PVC

A. Provide 1/4" nylon pull rope in all primary power and incoming telephone service entrance conduits.

B. Use rigid, PVC schedule 80, encased in concrete where called for on drawings, for emergency power circuits and normal power circuits not serving patient care areas.

C. No PVC shall emerge from the ground or the concrete slab or encasement. PVC shall convert to galvanized rigid metal prior to penetrating slab or exiting concrete encasement.

D. Make bends with standard ells or with an approved bender. A blow torch shall not be used.

3.03 FLEXIBLE METAL CONDUIT

A. Conduits shall be 3/8" minimum size for lighting fixtures and 1/2" minimum size for utilization equipment other than lighting fixtures.

B. Fittings shall be made of either steel, or malleable iron only.

C. A copper ground wire shall be installed as a jumper around flexible conduit. The jumper may be installed inside of flexible conduit or outside of conduit to ensure continuity of ground.

D. Recessed lighting fixtures shall be connected with flexible metallic conduit from outlet box to fixture.

E. Install liquid tight flexible conduit in such a manner as to prevent liquids from running on the surface toward fittings.

F. Allow sufficient slack conduit to reduce the effect of vibration.

END OF SECTION

SECTION 26 05 34

PULL AND JUNCTION BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide pull and junction boxes of appropriate size and depth as indicated on the drawings and as specified hereinafter.

1.02 RELATED WORK

A. Section 26 05 29: Hangers and Supports for Electrical Systems.

B. Section 26 05 33: Raceways and Conduit Systems.

C. Section 26 05 53: Identification for Electrical Systems.

1.03 SUBMITTALS

A. Submit product data for each type of box used in exterior work.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. For interior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4" flanges and screw covers.

B. For exterior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4" flanges, bolted covers with full gaskets forming a completely rain tight assembly, equal to Keystone 19000, and 37900 series.

C. For exterior work in graded areas outside the building, provide heavy duty sidewalk junction boxes externally flanged for flush mounting. Covers shall be fully gasketed, watertight and secured with stainless steel screws or bolts equal to Quazite type PC.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Provide junction boxes as shown on drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4" square and 2-1/8" deep.

B. Provide screw covers for junction boxes.

C. Install boxes in conduit runs wherever necessary to avoid excessive runs or bends. Do not exceed 100' runs without pull boxes.

D. Rigidly secure boxes to walls or ceilings. Conduit runs will not be considered as adequate support.

E. Install boxes with covers in accessible locations. Size boxes in accordance with Articles 314 of the National Electrical Code.

F. Do not install pull or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box.

END OF SECTION

SECTION 26 05 35

OUTLET BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide each fixture, switch, receptacle, and other wiring device with a galvanized outlet box of appropriate size and depth for its particular location and use.

1.02 RELATED WORK

A. Section 26 05 29: Hangers and Supports for Electrical Systems.

B. Section 26 05 33: Raceways and Conduit Systems.

C. Section 26 05 53: Identification for Electrical Systems.

1.03 SUBMITTALS

A. Submittal of products furnished under this Section is not required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. National

B. Appleton.

C. Raco.

D. General Electric.

E. Steel City.

2.02 SUPPORTING DEVICES

A. Provide appropriate supporting devices for outlet boxes by Caddy Fasteners or equal as follows:
   1. "RB" box mounting brackets.
   2. Screw gun box brackets.
   3. "H" box mounting brackets.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Locate boxes to prevent moisture from entering or accumulating within them.

B. Support outlet boxes independently of conduit, as required by the National Electrical Code.

C. Provide 4" octagonal x 1-1/2" deep ceiling outlet boxes. For increased cubic capacity, provide 4" octagonal x 2-1/8" , 4" square x 1-1/2" or 4-11/16" square x 2-1/8" ceiling outlet boxes.

D. Provide 4" square X 1-1/2" deep boxes for switch and receptacle outlets in drywall partitions. Use square cut plaster rings installed within 1/4" of finished wall.

E. Provide 4" square x 2-1/2" deep boxes for telephone/data outlets in drywall partitions. Use square cut plastic rings installed within 1/4" of finished wall.

F. Where required to hang a specified fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.

G. Provide 2-1/2" x 3-3/4" one gang masonry boxes for switches and receptacles installed in concrete block walls not plastered. For increased cubic capacity, provide 3-1/2" x 3-3/4" one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4" square boxes with square cut device covers not less than 1" deep specifically designed for this purpose. Use round edge plaster rings only if the block walls are to be plastered. Use sectional or gangable type outlet boxes only in drywall construction.

H. Provide 4-11/16" square X 2" deep outlet boxes with square cut device corners for block walls or round edge plaster rings for plastered walls for telephone outlets, data outlets, and private intercom interphones. Single gang device boxes are not acceptable.

I. Provide fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlets only for ceiling fixture outlets. Provide condulets with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere, damage, or mar the appearance of the installation.

J. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed in compliance with Article 314 of the NEC.

K. Effectively close unused openings in boxes with metal plugs or plates.

L. Set boxes so that front edges of device extensions, plaster rings, etc are flush with finished surfaces.

M. Caddy "H" type box mounting brackets shall not be used on exterior walls, chase walls, or in any other installation where the backside of the stud wall will not be finished. Do not use 4" brackets in thicker stud walls which will not provide adequate bracing.

N. Secure boxes to surfaces upon which they are mounted or embed boxes in concrete masonry. Support boxes from structural members with approved braces.

O. Install blank device plates on outlet boxes left for future use.

P. Provide bushings in holes through which cords or conductors pass.

Q. Install boxes so that the covers will be accessible at all times.

R. Electrical outlet boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings occur on one side only in each framing space, that openings do not exceed sixteen square inches and that boxes on opposite faces of a partition are separated horizontally not less than 24 inches. All clearances between such outlet boxes and the gypsum board shall be completely filled with joint compound or approved fire-resistive compound. The wall shall be built around outlet boxes larger than sixteen square inches so as not to interfere with the wall rating.

S. Install outlet boxes on opposite sides of the same wall offset to avoid back to back mounting where possible.

END OF SECTION

SECTION 26 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with provisions of Sections 26 05 00.

B. Concrete encased underground non-metallic conduit duct bank.

1.02 REFERENCES

A. ANSI C2-97, National Electrical Safety Code.

B. NEMA TC 2-90, Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

C. NEMA TC 3-90, PVC Fittings for Use with Rigid PVC Conduit and Tubing.

D. UL 651_89, UL Standard for Safety - Schedule 40 and 80 Rigid PVC Conduit.

1.03 SUBMITTALS

A. Products furnished from listed manufacturers are pre-approved and require no submittal.

B. Submit proposed substitutions for approval.

C. Submit for information as-built drawings indicating accurate routing of underground duct banks.

1.04 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by UL as suitable for purpose specified and shown.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products. Protect on-site storage from weather.

B. Accept conduit on-site. Inspect for damage.

C. Protect nonmetallic conduit from entrance of debris, and provide appropriate covering to protect from sunlight.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carlon

B. Allied Tube and Conduit

2.02 RIGID NON-METALLIC CONDUIT

A. Rigid PVC Conduit: NEMA TC 2; UL 651 listed; Schedule 40.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.03 CAST-IN-PLACE CONCRETE

A. Concrete: Refer to Division 03.

B. Concrete shall have minimum 28-day strength of 3,000 psi.

C. Reinforcement: Duct banks under concrete or pavement and subject to traffic shall be reinforced. The reinforcement shall extend a minimum of 10 feet from edge of concrete or pavement.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify routing and termination locations of conduit duct bank prior to excavation.

B. Verify field measurements.

C. Verify conduit is anchored prior to placing concrete.

3.02 PREPARATION

A. Excavate, trench, and prepare site for underground conduit duct bank installation.

3.03 INSTALLATION

A. Where necessary to cut conduit, use saw or pipe cutter; ream cut ends. Bring conduit to shoulder of fittings; fasten securely.

B. Join nonmetallic conduit using cement recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

C. Use suitable separators and chairs installed not greater than 4 ft on centers. Band conduit together with suitable banding devices. Anchor conduit to prevent movement during concrete placement.

D. Stagger conduit joints in concrete encasement 6 in. min, vertically.

E. Install conduit with minimum grade of 3-inches/100 ft. (Only required where conduit terminates at a manhole.)

F. Depth: Per ANSI C2; top of duct bank 18 in. minimum, 30 inches maximum below finished grade unless approved by the Engineer.

G. Terminate conduits with Termi-Duct type end bells at manhole entries.

H. Use suitable caps to protect installed conduit from entrance of dirt and moisture.

I. Duct banks installed under grass and other non-traffic areas do not require any additional reinforcement steel. Duct banks installed below load bearing building concrete slabs may need to be reinforced and must be coordinated with the general contractor.

J. Duct banks installed under concrete or pavement subject to vehicular traffic shall be reinforced in the following manner.
   1. Place #4 steel rebar in the top and both sides of the duct bank in the horizontal plane and lengthwise direction. There shall be one rebar in each corner with a maximum distance of 8 inches between rebars.
   2. Place a "U" shaped stirrup fabricated from #4 rebar in the vertical plane every 3 feet in the lengthwise direction.
   3. Rebar shall be tied together in an acceptable manner using standard steel tie wire.
   4. All rebar shall have a minimum concrete cover of 2 inches.

K. Pour concrete into formed bank of conduits. Provide a minimum of 3 inches of concrete cover at bottom, top, and sides of conduit duct bank. Vibrate concrete with a mechanical vibrator to ensure proper concrete fill and elimination of voids.

L. Uniformly dust red iron oxide over top of freshly poured concrete at the rate of 1 lb/yd of surface.

M. Duct banks shall be backfilled in the following manner.
   1. Duct banks installed under grass and other non-traffic areas shall be backfilled with clean suitable earth. The earth shall be compacted sufficiently to prevent any settlement.
   2. Duct banks installed under concrete or pavement subject to vehicular traffic shall be backfilled with #57 (3/4") washed limestone gravel. The gravel shall be compacted sufficiently to prevent any settlement. Coordinate with general contractor to ensure suitability for the concrete or pavement cover.

END OF SECTION

SECTION 26 05 44

PREFABRICATED CONCRETE MANHOLE

PART 1 GENERAL

1.01 WORK INCLUDED

A. This specification prescribes the minimum design and installation criteria to be applied when designing, manufacturing, and installing sectional pre-cast concrete electrical manholes.

B. The manhole shall be supplied in two sections. The size shall be 10'x 10' x 7' unless noted otherwise on the drawings. (Inside dimensions) The minimum wall thickness shall be 6 inches.

C. Comply with section 26 05 00.

D. Provide, install, and place in service all electrical manholes as indicated on the drawings and contract documents.

1.02 RELATED WORK

A. Section 26 05 43: Underground Ducts and Raceways for Electrical Systems

B. Section 26 05 13: Medium Voltage Cable

C. Section 26 05 19: Low Voltage Electrical Power Conductors

1.03 SUBMITTALS

A. Product data sheets on each type of manhole.

B. Drawings for each type and size manhole. Minimum size drawing shall be "C" (11" x 17").

1.04 QUALITY ASSURANCE

A. Each manhole manufacturer shall provide adequate documentation of a Quality Assurance program that will provide reasonable assurance that the manholes will be manufactured in accordance with this specification and all applicable industry standards and specifications.

1.05 CODES AND STANDARDS

A. American Concrete Institute.
   1. ACI-318 Building Code Requirements for Reinforced Concrete.

B. American Society for Testing Materials (ASTM)
   1. A615 -Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   2. A706 -Low-Alloy Steel Deformed Bars for Concrete Reinforcements.

3. C31 --Making and Curing Concrete Test Specimens in the Field.
4. C33 --Concrete Aggregates.
5. C39 --Compressive Strength of Cylindrical Concrete Specimens.
6. C94 --Ready Mixed Concrete.
7. C143 -Slump of Portland Cement Concrete.
8. C150 -Portland Cement.
9. C260 -Air-Entraining Admixture for Concrete.
10. C494 -Chemical Admixtures for Concrete.
11. C857 -Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
12. C858 -Underground Precast Concrete Utility Structures.
13. C891 -Installation of Underground Utility Structures.

C. American Welding Society (AWS).
1. D1-4, Structural Welding Code (reinforcing steel).
2. D-12, Recommended Practices for Welding Reinforcing Steel.
3. The manhole installation shall comply with the latest issue of the National Electrical Code, the National Electrical Safety Code, and all applicable local and state requirements.

PART 2 PRODUCTS

2.01 DESIGN LOADS

A. Design loads shall consist of dead loads live loads, and impact loads, Dead loads include hydrostatic pressure due to the water table assumed to be at three (3) feet. Live loads are designed for H-20 and/or H-20-44 traffic loads (16,000lb. wheel load). The dead load is considered to be the worst condition with the water table located at 3'-0" below the surface.

B. Precast concrete electrical manholes are to be designed in accordance with the American Association of State Highway and Transportation Officials (MSHTO), the American Society for Testing Materials (ASTM C-857), and the American Concrete Institute (ACI 318), as last revised. The electrical manholes are to be fabricated in accordance with ASTM C-658, customer drawings, and specifications.

2.02 FORMS

A. All forms used for the placement of concrete are of metal and structurally designed and constructed to maintain their alignment under the extreme pressure of the concrete during placement.

2.03 MATERIALS

A. Concrete
1. Portland cement shall conform to ASTM C150, "Specifications for Portland Cement" as last revised and shall be type II, low alkali Portland cement.
2. Fine Aggregates shall conform to the requirements of ASTM C-33 "Specifications for Concrete Aggregates". These fine aggregates shall be properly graded and free of any deleterious materials to produce a homogenous concrete matrix when mixed with cement.

3. Coarse Aggregates shall conform to the requirements of ASTM C-33, "Specifications for Concrete Aggregates". The maximum size of aggregate shall conform to those requirements specified in the mix design. These aggregates shall be properly graded and free of any deleterious materials to produce a homogenous concrete matrix when mixed with cement.
4. Lightweight aggregates shall conform to the requirements of ASTM C-330, Specification for Structural Concrete".
5. Water used in mixing concrete shall be potable, free from deleterious amounts of oils, acid, alkalis, salts, organic materials, or other substances which may adversely affect the properties of the concrete Non-potable water may be used as mixing water provided that the mortar cubes made with non-potable water have a seven day strength (equal to no less than 90% the strength) of mortar cubes made with potable water.

2.04 ADMIXTURES SHALL CONFORM TO THE APPLICABLE SPECIFICATIONS AS FOLLOWS

A. ASTM C-260 - Chemical Admixtures for Concrete

B. ASTM C-494 - Fly ash and raw or calcined natural Pozzolan for use as a mineral admixture in Portland Cement Mix

C. ASTM C-618 - Pigments for integrally colored Concrete

2.05 REINFORCEMENT

A. All reinforcement steel, including welded wire mesh, shall be of the size and in the location as shown on the plans. All reinforcing shall be sufficiently tied to withstand any displacement during the pouring operation. All bars shall be intermediate grade, or as specified, billet steel conforming to ASTM A-615 or A-706 as required.

B. Steel reinforcing bars shall conform to those requirements set forth in the following specifications:
1. Specification for Deformed and Plain Billet Steel for Concrete Reinforcement" including supplemental requirements, ASTM A615 (Including SI).
2. Low Alloy Steel Deformed Bars for Concrete Reinforcement", A-706.
3. "Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement", ASTM A-185.

2.06 COMPRESSIVE STRENGTH

A. Sufficient cement content shall be used as to produce a minimum compressive strength of 4500 PSI at 28 days.

2.07 BATCHING

A. A central batching facility shall be used to assure accurate weighing and mixing of materials to obtain a suitable concrete mix.

2.08 PLACING

A. Concrete shall be made by properly proportioned parts of sand, aggregate, and cement with sufficient water to produce concrete mix of uniform quality and slump. Handling from the mixer or the transport vehicle to the forms for deposit will be in a continuous manner, as rapidly as practicable without segregation or loss of ingredients, until the unit or segment pouring is completed. Compaction by either external or internal mechanical vibration shall be used during the placement of the concrete mix.

2.09 CURING

A. Concrete while still in the forms may be steam cured after an initial set has taken place. Steam temperature shall not exceed 160 degrees Fahrenheit, and shall not be increased from ambient temperature at a rate exceeding 40 degrees Fahrenheit per hour. Steam curing shall be considered complete after sufficient time has elapsed to produce adequate strength to withstand any structural strain that may be subjected during the form stripping operation.

B. Additional curing may be applied by means of water spraying or membrane curing compound to reach the ultimate strength requirements.

2.10 WATER PROOFING

A. Butyl Rubber, SS-S-00210 shall be used as a joint sealant at all construction joints.

2.11 MANHOLE COVER

A. Cover shall be cast iron, USF 640, 770 pounds. The diameter shall be 40". It shall be inscribed with "ELECTRICAL".

B. The covers shall be fastened by a minimum of two penta-head type bolts 1/2 inch in diameter to prevent unauthorized removal.

2.12 CONDUIT FITTINGS

A. Term-A-Duct conduit inserts shall be installed per the drawings. They shall be sized for 5" Schedule 40 PVC conduit unless noted otherwise on the drawings. Unless otherwise noted on the drawings, the center-to-center distance shall be 7.5 inches. The minimum distance from edge of duct to a wall or construction joint shall be 6 Inches. Unless otherwise noted on the drawings, the duct group shown shall be installed in the center of each wall of each section of the manhole. There shall be at least two spare inserts in each side whether shown or not.

2.13 ANCHORS

A. 1/2" inserts shall be installed as required to facilitate installation of cable support racks. Inserts shall be installed a minimum of 18" centers horizontally and 12" centers vertically.

2.14 SUPPORTS

A. Metal support racks shall be installed every 18" horizontally and 12" vertically to properly support the cable. Supporting arm width and number of levels shall be determined by number of circuits.

2.15 PULLING IRONS

A. Imbedded pulling iron shall be installed in the floor of the manhole on all four sides.

2.16 GROUNDING

A. Each manhole shall have an opening in the bottom corner for a 3/4-inch ground rod. In addition, at each duct bank entrance, there shall be an opening for a 4/0 AWG bare copper wire.

B. A 4/0 bare copper wire shall be installed completely around the inside walls to provide for grounding of cable splices, support racks, etc. The wire shall be connected to the 4/0 bare wire in each duct bank and to the ground rod.

2.17 MANUFACTURER

A. Oldcastle Precast is the approved manufacturer. Products equal in all aspects from other manufacturers will be considered if they are submitted for approval no less than 10 days before bid date.

B. Vendor drawings will be submitted for approval before manufacturing is begun.

PART 3 EXECUTION

3.01 MANHOLES SHALL BE INSTALLED IN THE FOLLOWING MANNER

A. The manhole shall be installed so that the top of the concrete cover is 6 inches below the ground elevation. This will allow the top of the steel manhole cover to be 4 inches above the ground elevation. Note that the ground should be rounded up to be flush at the manhole cover location and sloped away in a minimum 20-foot circle to provide proper drainage away from manhole cover.

B. If the manhole is installed in a street or other paved or concrete area, the manhole cover must be flush with the finished pavement or concrete.

C. The hole shall be excavated to a depth at least 6 inches deeper than required for the proper elevation of the manhole and this excess depth filled with 1/2-inch gravel and compacted to a density sufficient to support the manhole without any settling. A pneumatic compactor shall be used.

D. The earth shall be back-filled around the manhole and compacted before trenching for the duct banks begins.

E. Raceway numbers shall be stenciled above each conduit entrance with minimum 3-inch high letters.

F. The ground rod and grounding cable openings shall be sealed after all devices are installed.

G. Ballast weight shall be added to manhole where required to prevent floating due to water pressure.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Requirements for identification of electrical equipment, circuit identification, system color coding and warning signs.

1.02 RELATED WORK

A. Section 26 05 00: Common Work Results for Electrical

1.03 SUBMITTALS

A. Submittal of product furnished under this section is not required.

PART 2 PRODUCTS

2.01 IDENTIFICATION OF EQUIPMENT

A. Identify electrical equipment with permanently attached phenolic plates with 1/4" white or black engraved lettering on the face of each, attached with two sheet metal screws. Provide nameplate colors as specified in other parts of this section.

B. Include the following information on panelboard identification plates:
   1. Panel Name
   2. Name of panel serving it
   3. Voltage and Phase

2.02 CIRCUIT IDENTIFICATION

A. Identify feeder j-boxes and pull boxes with designation of panelboard/switchboard source as "FROM" and load served as "TO" with permanent labels.

B. Identify pull and junction boxes with the designation of panelboard and the circuit number of each circuit contained therein, with permanent marker. Clearly mark information on or in the box, not on the cover, so that the information is easily identifiable.

C. Identify circuits in conduits entering outlet boxes with the designation of panelboard and the circuit number of each circuit contained therein, with permanent marker.

2.03 COLOR CODE IDENTIFICATION

A. Color code phenolic plates utilized to identify electrical equipment according to which branch of the electrical system the equipment is connected to as follows:
   1. Normal - Black with white letters.
   2. Fire Alarm - Red with white letters.

B. If existing equipment identification nameplates are a different color, request a ruling from the design professional to determine what color scheme to follow.
   1. Fire Alarm System - Red

2.04 WARNING SIGNS

A. Provide warning signs called for by NFPA 70, by OSHA and by the list included below.

B. Use Seton Name Plate Company products, 10" x 7" size, pressure-sensitive (PSPL) for indoor use, 30 ga. baked enamel for outdoor use (30 BE) with style numbers shown below.

C. Danger - Electrical Hazard - Authorized Personnel Only, Style No. 161.
   1. Main electrical room(s),
   2. Electrical equipment closet(s).

PART 3 EXECUTION

3.01 INSTALLATION

A. Identify the following electrical equipment as called for herein:
   1. Switchboards, switchgear, and individual devices installed in them.
   2. Panelboards.
   3. Safety switches and disconnects.
   4. Contactors and motor starters.
   5. Cabinets:
      a. Fire Alarm Cabinets
      b. Lighting Control Cabinets
   6. Individually mounted circuit breakers.
   7. Relays.
   8. Shunt trip pushbuttons:
      a. Main Service Disconnects.
      b. Computer Power
      c. Computer HVAC power.
   9. Transformers. Starters and relays connected under this Division shall be identified whether furnished under this Division or under other Divisions.

END OF SECTION

SECTION 26 05 73

POWER SYSTEM ANALYSIS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Short-circuit and protective device coordination studies as prepared by the electrical equipment manufacturer or a professional electrical engineering firm.

B. Arc Flash Hazard Analysis Study per the requirements set forth in NFPA 70E - Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according IEEE 1584.

C. The studies shall include all new electrical distribution equipment supplied under this contract.
   1. Include all directly affected existing distribution equipment including emergency equipment at the customer facility.
   2. Include all existing distribution equipment including emergency equipment at the customer facility.

1.02 RELATED SECTIONS

A. Section 26 05 00: Common Work for Electrical

B. Section 26 24 13: Switchboards

C. Section 26 24 16: Panelboards

1.03 REFERENCES

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
   1. IEEE 141 - Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
   2. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
   3. IEEE 399 - Recommended Practice for Industrial and Commercial Power System Analysis
   4. IEEE 241 - Recommended Practice for Electric Power Systems in Commercial Buildings
   5. IEEE 1015 - Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems
   6. IEEE 1584 - Guide for Performing Arc-Flash Hazard Calculations

B. American National Standards Institute (ANSI):
   1. ANSI C57.12.00 - Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
   2. ANSI C37.13 - Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures

3. ANSI C37.010 - Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
4. ANSI C 37.41 - Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories

C. The National Fire Protection Association (NFPA)
1. NFPA 70 - National Electrical Code
2. NFPA 70E - Standard for Electrical Safety in the Workplace

1.04 SUBMITTALS FOR REVIEW/APPROVAL

A. Submit a preliminary short-circuit and protective device coordination study to the design engineer prior to receiving final approval of the shop drawings and/or prior to release of equipment drawings for manufacturing. The preliminary study shall provide sufficient data to ensure that the selection of equipment will have adequate ratings and the protective device trip characteristics will be satisfactory.

B. Submit the final short-circuit and protective device coordination analysis at the end of the construction cycle when circuits are installed and all equipment is on site and/or installed such that complete and accurate data may be obtained.

C. Submit the arc flash hazard analysis at the end of the construction cycle when circuits are installed and all equipment is on site and/or installed such that complete and accurate data may be obtained.

1.05 SUBMITTALS FOR CONSTRUCTION

A. The results of the final short-circuit, protective device coordination, and arc flash hazard (if required) analysis studies shall be summarized in a final report. No more than five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short-circuit input and output data. Additional copies of the short-circuit input and output data, where required, shall be provided on CD in PDF format.

B. At the owner's option, the contractor is required to provide the study project files to the Owner in electronic format including all project files, libraries, etc to allow the owner to update and to print additional copies, labels, etc.

C. If the owner does not use the applicable computer program, a copy of the computer analysis software viewer program is required to accompany the electronic project files, to allow the Owner to review all aspects of the project and print arc flash labels, one line diagrams, etc.

D. The report shall include the following sections:
1. Executive Summary.
2. Descriptions, purpose, basis and scope of the study.
3. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short circuit duties.

4. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip unit settings, and fuse selection.
5. Fault current calculations including a definition of terms and guide for interpretation of the computer printout.
6. Details of the incident energy and flash protection boundary calculations.
7. Recommendations for system improvements, where needed.
8. One line diagram.
9. Equipment specific arc flash labels.

E. If the power systems study submittal is not approved following the second submittal, the contractor shall pay the Project Engineer $200.00 per hour to review additional submittals until the study is approved.

1.06 QUALIFICATIONS

A. The short-circuit, protective device coordination and arc flash hazard analysis studies (if required) shall be conducted under the supervision and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.

B. The Registered Professional Electrical Engineer shall be a full-time employee of the electrical equipment manufacturer or a professional electrical engineering firm.

C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

D. The equipment manufacturer or approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting a detailed plan outlining the steps to be taken to ensure a proper outcome (if required).

1.07 COMPUTER ANALYSIS SOFTWARE

A. The studies shall be performed using the latest revision of the SKM Systems Analysis Power*Tools for Windows (PTW) software program. Other commercially available products may be considered under certain circumstances.

PART 2 PRODUCT

2.01 STUDIES

A. Furnish short-circuit and protective device coordination studies as prepared by the electrical equipment manufacturer or a professional electrical engineering firm.

B. Furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace.

2.02 DATA COLLECTION

A. Contractor shall furnish all data as required by the power system studies. The Engineer performing the short-circuit, protective device coordination, and arc flash hazard analysis studies (if required) shall furnish the Contractor with a list of required data immediately

after award of the contract. The Contractor shall expedite collection of the data to ensure completion of the studies as required.

B. The engineer performing the study shall make at least one job site visit before completion of the final study to familiarize himself/herself with the project to ensure that the provided data is accurate.

C. Source contribution shall include present and future motors and generators.

D. Load data utilized shall include existing and proposed loads obtained from Contract Documents provided by Owner, or Contractor.

E. If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.03 SHORT-CIRCUIT STUDY

A. Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standard 141.

B. Estimated conductor lengths, typical generator, transformer, motor, and utility data may be used for the preliminary study.

C. Actual installed conductor lengths, test and/or nameplate data for all generators, transformers, motors 50 HP and larger, capacitors, reactors, or other equipment that may affect the study must be used for the final study.

D. Actual utility fault current and X/R ratio shall be used Infinite bus calculation is not acceptable.

E. The pre-fault bus voltage shall be the highest reported by the utility for past 5 years. If unavailable, 1.05 per unit shall be used.

F. Provide the following:
   1. Calculation methods and assumptions.
   2. Selected base per unit quantities.
   3. One line diagram of the system being evaluated.
   4. Utility impedance data, including the maximum and minimum 3 phase and line-to-ground fault current available, nominal, maximum, and minimum voltage, 3 phase X/R ratio line-to-ground X/R ratio.
   5. Utility protective device settings including recloser if used.
   6. Motor fault contribution characteristics.
   7. Generator fault contribution characteristics.
   8. Tabulations of calculated quantities.
   9. Results, conclusions, and recommendations.

G. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:
   1. Electric utility's supply termination point
   2. Incoming switchgear
   3. Unit substation primary and secondary terminals

4. Low voltage switchgear.
5. Motor control centers.
6. Standby generators and automatic transfer switches.
7. Branch circuit panelboards.
8. Other significant locations throughout the system.

H. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.

I. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to short circuit ratings.
2. Adequacy of switchgear, switchboards, disconnects, transfer switches, motor control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Notify Owner, in writing, of any existing circuit protective devices improperly rated for the calculated available fault current.

2.04 PROTECTIVE DEVICE COORDINATION STUDY

A. Proposed protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs. No more than 5 devices shall be shown on any plot.

B. Include on each TCC graph, a complete title, applicable notes, and one-line diagram with legend identifying the specific portion of the system covered.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the TCC graphs, where applicable:
1. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
2. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
3. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves. The frequent fault portion of the damage curve should not be shown unless the transformer feeds overhead lines. The shifted curve for line-to-ground faults on the secondary side shall be shown on the ground fault plot.
4. Conductor damage curves.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

2.05 REPORT SECTIONS

A. Input data shall include, but not be limited to the following:
1. Feeder input data including feeder type (cable or bus), size, length, number per phase, conduit type (magnetic or non-magnetic) and conductor material (copper or aluminum).

2. Transformer input data, including winding connections, secondary neutral-ground connection, primary and secondary voltage ratings, KVA rating, impedance, % taps and phase shift.
3. Reactor data, including voltage rating, and impedance.
4. Generation contribution data, (synchronous generators and Utility), including short-circuit reactance (X"d), rated MVA, rated voltage, three-phase and single line-ground contribution (for Utility sources) and X/R ratio.
5. Motor contribution data (induction motors and synchronous motors), including short circuit reactance, rated horsepower or KVA, rated voltage, and X/R ratio.

B. Short-Circuit Output Data shall include, but not be limited to the following reports:
1. Low Voltage Fault Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
   a. Voltage
   b. Calculated fault current magnitude and angle
   c. Fault point X/R ratio
   d. Equivalent impedance
2. Momentary Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
   a. Voltage
   b. Calculated symmetrical fault current magnitude and angle
   c. Fault point X/R ratio
   d. Calculated asymmetrical fault currents
3. Based on fault point X/R ratio
4. Based on calculated symmetrical value multiplied by 1.6
5. Based on calculated symmetrical value multiplied by 2.7
   a. Equivalent impedance
6. Interrupting Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
   a. Voltage
   b. Calculated symmetrical fault current magnitude and angle
   c. Fault point X/R ratio
   d. No AC Decrement (NACD) Ratio
   e. Equivalent impedance
   f. Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a symmetrical basis
   g. Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a total basis

C. Recommended Protective Device Settings:
1. Phase and Ground Relays:
   a. Current transformer ratio
   b. Current setting
   c. Time setting
   d. Instantaneous setting
   e. Recommendations on improved relaying systems, if applicable.
2. Circuit Breakers:
   a. Adjustable pickups and time delays (long time, short time, ground)

b. Adjustable time-current characteristic
c. Adjustable instantaneous pickup
d. Recommendations on improved trip systems, if applicable.

PART 3 EXECUTION

3.01 FIELD ADJUSTMENT

A. Adjust relay and protective device settings according to the recommended settings table provided by the coordination study. Field adjustments to be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to provide for conformance with short circuit and protective device coordination studies.

C. Notify Owner in writing of any required major equipment modifications.

3.02 ARC FLASH WARNING LABELS

A. The label shall include the following information, at a minimum:
1. Location designation
2. Nominal voltage
3. Hazard risk category
4. Incident energy
5. Working distance
6. Engineering report number, revision number and issue date.

B. Labels shall be machine printed, with no field markings.

C. Labels shall be field installed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

END OF SECTION

SECTION 26 22 13

LOW VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide dry type transformers as shown on drawings.

1.02 RELATED SECTIONS

A. Section 26 05 26: Grounding and Bonding for Electrical Systems

B. Section 26 05 53: Identification for Electrical Systems.

1.03 REFERENCES

A. ANSI/IEEE C57.96 - Distribution and Power Transformers, Guide for Loading Dry-Type (appendix to ANSI C57.12 standards)

B. ANSI/IEEE C89.2 - Dry Type Transformers for General Applications

C. ANSI/NFPA 70 - National Electrical Code

D. IEEE C57.12.01 - General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid Cast and / or Resin-Encapsulated Windings

E. IEEE C57.12.91 - Test Code for Dry-Type Distribution and Power Transformers

F. NEMA ST 20 - Dry Type Transformers for General Applications

G. UL 506 - Specialty Transformers

1.04 SUBMITTALS

A. Submit products for review.

B. Submit dimensioned equipment location layouts in accordance with section 26 05 00.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D

B. Eaton/Cutler-Hammer

C. General Electric

D. Siemens

2.02 EQUIPMENT REQUIREMENTS

A. Provide general purpose, self cooled dry type transformers designed for 60 Hz operation as shown on drawings. Transformers to be designed, manufactured and tested in accordance with the latest ANSI, NEMA and IEEE Standards. Transformers to be listed and labeled in accordance with UL 1561.

B. Transformers to be compliant with NEMA TP-1 energy efficiency requirements per EPAct 2005/CFR 10 Part 431.

2.03 INSULATION SYSTEM

A. Provide ventilated type transformers for 15 KVA and larger with a UL recognized 220 degree insulation system. Base the KVA ratings on an allowable 80, 115 or 150 degree C winding temperature rise above a 30 degree hot spot.

B. Transformer design KVA Rating shall be suitable for a 30 degree C average and 40 degree C maximum ambient temperature.

2.04 CORE AND COIL

A. Core construction to be of non-aging electrical grade grain-oriented silicon steel to minimize hysteresis and eddy current losses. Core lamination shall be tightly assembled.

B. Provide windings wound of high quality copper or aluminum.

C. Arrange ventilated windings to brace coil layers and provide maximum ventilation. Construct core and coil assemblies to provide short circuit withstand capability as defined by ANSI and NEMA standards. Securely bolt complete assembly to the enclosure base using vibration dampening pads to reduce noise.

D. The complete core and coil shall be impregnated with non-hydroscopic, thermo-setting polyester varnish to provide a high dielectric and flame retardant seal. The shield of varnish to the coils shall effectively impregnate the entire core and coil assembly that results in a unit which is virtually impermeable to moisture, dust, salt air and other contaminants. Cast encapsulated core and windings in a resin compound to provide a moisture-proof, shock-resistant, high dielectric seal.

E. Provide full capacity taps in the high-voltage windings of transformers. For 3 phase transformers rated below 15 KVA, provide two 5% full capacity below normal taps . For 3 phase transformers rated 15 KVA and above, provide two 2.5% full capacity above normal taps and four 2.5% full capacity below normal taps

2.05 ENCLOSURES

A. Provide NEMA 1 ventilated enclosures of heavy gauge steel construction for indoor transformers. Provide weather shields for ventilated transformers installed outdoors

conforming to the requirements of NEMA 250, Type 3R. Finish enclosures in ANSI 61 gray paint.

B. Unless otherwise specified, sound levels shall be in accordance with values allowed by NEMA ST-20.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Provide flexible conduit to and from transformer.

B. Install transformers in accordance with manufacturer's recommendations.

C. Provide vibration isolation devices whether floor mounted or hung from structure as follows:
   1. Install floor mounted transformers on two (2) layer, one (1) inch thick, rubber neoprene pads with galvanized shims (Mason Super "W" or equal).
   2. For suspended transformers provide spring hangers (Mason 30N or equal) with double neoprene elements at the top of the device with spring seated neoprene cups at the base of the device for sway bracing purposes.

D. Provide working clearances around transformers in accordance with Article 110 of the National Electrical Code.

E. Provide separation and clearance around transformers in accordance with manufacturer's recommendation to allow adequate cooling.

F. Ground transformers in accordance with Articles 250 and 450 of the National Electrical Code.

G. Mount floor mounted transformers on one inch (1") thick rubber pad.

END OF SECTION

SECTION 26 24 13

SWITCHBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and install a complete system of Low Voltage, Type 1 and/or Type 2 switchboards with circuit breakers and/or fusible switches for mains, ties. and feeders as specified below and as indicated on the drawings.

B. The requirements of the Contract, Division 01 and Division 26, apply to work in this section.

1.02 RELATED SECTIONS

A. Section 26 05 00: Common Work Results for Electrical

B. Section 26 43 13: Transient Voltage Surge Suppression

1.03 REFERENCES

A. The low voltage switchboards and protection devices in this specification are designed and manufactured according to latest revision of the following applicable standards.
   1. ANSI C37.16, Low Voltage Power Circuit Breakers and AC Power Circuit Protectors, Preferred Ratings, Related Requirements and Application Recommendations for
   2. ANSI/IEEE C37.13. Low-voltage AC power circuit breakers used in enclosures.
   3. ANSI/NEMA PB 2, Deadfront Distribution Switchboards
   4. ANSI/NEMA PB 2.1, General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less
   5. ANSI/NFPA 70, National Electrical Code
   6. NEMA AB 1, Molded Case Circuit Breakers and Molded Case Switches
   7. NEMA KS 1, Fused and Non - Fused Switches
   8. UL 489, Molded Case Circuit Breakers and Circuit Breaker Enclosures
   9. UL 891, Dead Front Switchboards
   10. UL 98, Enclosed and Dead Front Switches
   11. UL 1066, Low Voltage AC and DC Circuit Breakers Used in Enclosures
   12. UL 977, Fused Power Circuit Devices

1.04 DEFINITIONS

A. Insulated Case Circuit Breaker: Molded case circuit breaker built and listed to UL489 requirements. Insulated case circuit breakers are distinguished from normal molded case circuit breakers by the stored energy mechanism employed to open and close and the inclusion of internal motor operators when electrical operation is required.

B. Low Voltage Power Circuit Breaker: Also typically referred to as "air circuit breaker", "metal frame circuit breaker," or "ANSI circuit breaker". Differentiated from molded case and insulated case circuit breakers by many characteristics defined in the applicable UL and ANSI standards, including but not exclusively, significant 30 cycle withstand ratings, single pole ratings, and ease of maintenance.

C. Bolted Pressure Switch: Also referred to as high pressure contact switches. A type of switch with a spring loaded mechanism to close or open the circuit and a method of applying high pressure to the contacts to ensure high ampacity similar to a bolted bus joint.

D. Front-Accessible Only: Shall be as defined by UL 891 standard which requires that all line and load connections for phase, neutral, and ground conductors be accessible front the front of the switchboard allowing it to be mounted against a wall.

1.05 SYSTEM DESCRIPTION

A. The power system feeding the switchboard shall be 277/480 volt, solidly grounded wye unless noted otherwise on the drawings.

B. Switchboard(s) shall have front access and rear alignment for mounting against a wall or rear access as indicated on the drawings.

1.06 SUBMITTALS

A. Manufacturer shall provide minimum of 8 copies of the following documents, where applicable, to owner for review and evaluation in accordance with general requirements of Division 01 and Division 26:
   1. Front view and floor plan of switchboard
   2. Switchboard anchoring locations
   3. Conduit and busway entry / exit locations
   4. One-line diagram of switchboard bus and protective devices
   5. Switchboard ratings including:
      a. Short circuit rating
      b. System voltage rating
      c. Continuous current rating
   6. Protective device schedule including:
      a. Device type
      b. Sensor and trip rating
      c. Location within the switchboard
      d. Cable quantity and size capabilities for each device
   7. Panel drawing showing all major protection, instrumentation, and control devices mounted within the switchboard
   8. Schematic diagram showing power, metering, and control circuits for the switchboard and circuit breakers
   9. Bill of Material listing (including quantity, location, catalog number, and ratings) of all major protection, instrumentation and control devices
   10. Switchboard nameplate schedule

1.07 PROJECT RECORD DOCUMENTS

A. Manufacturer shall submit minimum 8 copies:
   1. Include as built record drawings as follows:
      a. Front View
      b. Floor Plan
      c. Elementary Diagram showing power, metering and control circuits
      d. Switchgear internal wiring diagrams
      e. Bill of Material
      f. One Line Diagram
      g. Three Line Diagram
   2. Instruction books on major components
   3. Installation drawings
   4. Certified test reports
   5. Recommended renewal parts information

1.08 INSTALLATION, OPERATION AND MAINTENANCE DATA

A. Manufacturer shall provide minimum 8 copies of installation, operation, and maintenance procedures to owner in accordance with general requirements of Division 01 and Division 26.

B. Submit operation and maintenance data based on factory and field testing, operation and maintenance of specified product.

1.09 QUALITY ASSURANCE QUALIFICATIONS

A. Manufacturer shall have specialized in the manufacture and assembly of low voltage switchboards for 25 years.

B. Manufacturer shall have available for review, if requested by the engineer, a certificate of ISO 9002 Compliance.

1.10 REGULATORY REQUIREMENTS

A. Low voltage switchboards shall be listed and/or classified by Underwriters Laboratories in accordance with standards listed in paragraph 1.03 of this specification and shall bear UL labels in accordance with those standards.

B. Switchboards shall be qualified for use in seismic loading UBC zone that is appropriate for the site location as defined in IEEE 693.

C. Where used as service entrance equipment, it shall be listed as a service entrance switchboard.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall store, protect, and handle products in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals.

B. Ship each switchboard section in individual shipping splits for ease of handling. Each section shall be mounted on shipping skids and wrapped for protection.

C. Contractor shall inspect and report concealed damage to carrier within 48 hours.

D. Contractor shall store in a clean, dry space. Cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Provide heat in the enclosures to prevent condensation.

E. Contractor shall handle in accordance with manufacturer's recommendations to avoid damaging equipment, installed devices, and finish.

1.12 PROJECT CONDITIONS (SITE ENVIRONMENTAL CONDITIONS)

A. Follow applicable NEMA, ANSI, and NECA standard practices before, during, and after switchboard installation.

B. Indoor switchboards shall be located in well-ventilated areas, free from excess humidity, dust, and dirt and away from hazardous materials. Ambient temperature of area will be between 0 and plus 40 degrees C.

C. Outdoor switchboards shall be located in well-ventilated areas, and away from hazardous materials. Ambient temperature of area will be between minus 30 and plus 40 degrees C.

1.13 SEQUENCING AND SCHEDULING

A. Provide a written detailed description of scheduled installation, testing, and startup dates.

1.14 WARRANTY

A. Manufacturer warrants equipment to be free from defects in materials and workmanship for 1 year from date of acceptance by the owner or 18 months from date of delivery, whichever occurs first.

1.15 FIELD MEASUREMENTS

A. Contractor shall make all necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in National Electrical Code.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approved manufacturers are:
   1. General Electric
   2. Eaton/Cutler Hammer
   3. Siemens Energy Automation
   4. Square D

B. Other manufacturers' products of equivalent quality, dimensions and operating features may be acceptable, at the Engineer's discretion, if they comply with all requirements specified or indicated in these Contract documents. Request for approval shall be submitted 10 business days before bid date. Substitutions will not be considered after this date.

2.02 EQUIPMENT

A. Furnish Low Voltage Switchboards with molded case, insulated case, steel frame power circuit breakers, fusible switches, and/or bolted pressure switches as indicated on drawings and in this specification.

B. Provide unit substation transformers where indicated on the drawings and as specified in transformer specifications.

2.03 COMPONENTS

A. Refer to Contract Drawings for actual layout and location of equipment and components; current ratings of devices, bus bars, and components; voltage ratings of devices, components and assemblies; interrupting and withstand ratings of devices, buses, and components; and other required details.

B. General
   1. The low voltage switchboards shall be rated 480/277 volts, 3 phase, 4-wire with 100 percent neutral, 60 hz unless indicated otherwise on the drawings.
   2. Switchboards shall include all protective devices and equipment listed on drawings with necessary interconnections, instrumentation, and control wiring.

C. Enclosure
   1. Indoor switchgear shall be furnished with an NEMA 1 enclosure and outdoor switchgear with a NEMA 3R non walk-in enclosure unless indicated otherwise on the drawings.

D. Structure (Type 1 & 2)
   1. Switchboards shall be fully self-supporting structures with 90 inch tall vertical sections (excluding lifting eyes and pull boxes) bolted together to form required arrangement.
   2. Switchboard frame shall be die formed, 12 gauge steel with reinforced corner gussets. Frame shall be rigidly bolted to support cover plates (code gauge steel), bus bars, and installed devices during shipment and installation.
   3. All sections may be rolled, moved, or lifted into position. Switchboards shall be capable of being bolted directly to the floor without the use of floor sills.
   4. All switchboard sections shall have open bottoms and removable top plate(s) to install conduit.
   5. Type 1 front-access only switchboards shall be rear aligned for placement against a wall or free standing. Type 2 front/rear-access switchboards shall be front and rear aligned for free standing.
   6. Switchboards shall be UL listed.
   7. All covers shall be fastened by hex head bolts.

8. Provide hinged doors over metering compartments and individually mounted device compartments. All doors shall have concealed hinges and be fastened by hex head bolts.
9. Switchboard protective devices shall be furnished as listed on drawings and specified herein, including interconnections, instrumentation, and control wiring. Switchboards and devices shall be rated for the voltage and frequency listed on the drawings.
10. Switchboard current ratings, including all devices, shall be based on a maximum ambient temperature of 25 degree C per UL Standard 891. With no de-rating required, temperature rise of switchboards and devices shall not exceed 65 degrees C in a 25 degree C ambient environment.

E. Bus Bars
1. Bus bars shall be tin-plated copper. The bus bars shall have sufficient cross sectional area to meet UL 891 temperature rise requirements through actual tests. Phase and neutral bus ampacity shall be as indicated on the drawings. The neutral bus shall have the same ampacity as the phase bus.
2. Bus bars shall be mounted on high impact, non-tracking insulated supports. Joints in the vertical bus are not permitted.
3. Bus bars shall be braced to withstand mechanical forces exerted during short circuit conditions as indicated in drawings, but in no case less than 65 kA RMS SYM.
4. A-B-C bus arrangement (left to right, top to bottom, and front to rear) shall be used throughout to assure convenient and safe testing and maintenance. Where special circuitry precludes this arrangement, bus bars shall be labeled.
5. All feeder device line and load connection straps shall be rated to carry current rating of device frame (not trip rating).
6. The main incoming bus bars shall be rated for the main protective device frame size or main incoming conductors, if there is no main device.
7. Main horizontal bus bars shall be fully rated and arranged for future extensions.
8. All draw-out breaker primary connections shall be silver-plated. Breaker primary connections for stationary-mounted breakers shall have the same plating as the main bus.
9. The main bus and riser bus shall be fully isolated from the circuit breaker, instrument, and auxiliary compartments. The vertical bus shall be mounted on supports of high impact, non-tracking, flame-retardant, molded glass-reinforced polyester. Vertical bus in molded case breaker sections shall be extended to all compartments in the section including blank compartments that may be at the top and / or bottom of the section.
10. A copper ground bus, 1.0 sq inches minimum, shall be secured to the rear frame of each vertical section and shall extend through the entire length of the switchboard. The ground bus shall be provided with a 4/0 terminal for connection to the electrical system ground. A lug strap shall be provided for each vertical section for feeder ground cable terminations.
11. All bus hardware shall be high tensile strength, grade 5, zinc-plated steel. All bolted bus joints shall be provided with split-type lock washers.

F. Service Entrance
1. Switchboard Service Entrance sections shall comply with UL Service Entrance requirements including a UL service entrance label, incoming line isolation

barriers, and a removable neutral bond to switchboard ground for solidly grounded wye systems.

G. Incoming Line Section
   1. Incoming line section shall be the ampacity, wiring system, and type of connection as shown on the drawings.
   2. Incoming line shall be directly connected to the transformer on unit substations.

H. Breaker Compartment
   1. Type 1 Switchboards
      a. Switchboards rated 1200 amperes or less shall have group mounted main and group mounted feeder devices.
      b. Circuit breakers 1200 ampere and below shall be molded case circuit breakers.
      c. Switches 1200 ampere and below shall be fusible switches.
   2. Class 2 Switchboards.
      a. Switchboards rated 1200 amperes or less shall have individually mounted main device and group mounted feeder devices.
      b. Circuit breakers 1200 ampere and below shall be molded case circuit breakers.
      c. Switches 1200 ampere and below shall be fusible switches.

2.04 CIRCUIT BREAKERS & FUSIBLE SWITCHES

A. Molded Case Circuit Breakers
   1. Group mounted breakers shall be connected to the vertical bus by bolted connections.
   2. Individually mounted molded case circuit breakers shall be stationary mounted.
   3. Circuit breaker frames shall be constructed of a high-strength, molded, glass-reinforced polyester case and cover. Breakers shall have an overcenter, toggle handle-operated, trip free mechanism with quick make, quick break action independent of the speed of the toggle handle operation. The design shall provide common tripping of all poles. Breakers shall be suitable for reverse feeding.
   4. Breakers shall have ON and OFF position clearly marked on escutcheon. Breakers shall include a trip-to-test means on the escutcheon for manually tripping the breaker and exercising the mechanism and trip latch.
   5. Breakers shall include factory installed mechanical lugs. Lugs shall be UL listed and rated 75 degrees C.
   6. Breakers 150 amperes and smaller shall have a electronic trip unit with true digital RMS sensing trip units and an interchangeable rating plug to determine the breaker trip rating. They shall have an adjustable instantaneous with short time tracking function.
   7. Breakers 225 amperes and larger shall have digital electronic trip units as described in paragraph 2.05.
   8. Breakers shall be UL listed as 100 percent continuous duty rated unless noted otherwise on the drawings.

B. Insulated Case Circuit Breakers
   1. Insulated case circuit breakers shall be individually mounted.
   2. Main and tie breakers shall be manually or electrically operated, stationary or draw-out as indicated on drawings. Feeder breakers larger than 1200 amps shall

be manually or electrically operated stationary or draw-out as indicated on drawings.

3. Breakers shall be constructed of a high dielectric strength, glass reinforced insulating case. The interrupting mechanism shall be arc chutes. Steel vent grids shall be used to suppress arcs and cool vented gases. Interphase barriers shall to isolate completely each pole.
4. Breakers shall contain a true two-step stored energy operating mechanism which shall provide quick make, quick break operation with a maximum five-cycle closing time. Breakers shall be trip free at all times. Common tripping of all poles shall be standard.
5. Insulated Case circuit breakers shall be rated to carry 100 percent of their frame ampacity continuously.
6. A charging handle, close push-button, open push-button, and Off/On/Charge indicator shall be located on the breaker escutcheon and shall be visible with the breaker compartment door closed.
7. Where draw-out breakers are specified, the draw-out design shall permit the breaker to be withdrawn from an engaged position, to a test position, and to a disengaged position.
8. Breaker digital electronic trip units shall be as described in paragraph 2.05.

C. Low Voltage Power Circuit Breakers

1. Circuit breakers shall be individually mounted, draw-out, low voltage devices, metal frame construction, manually or electrically operated as indicated on drawings with features and accessories as described in this specification.
2. Interrupting mechanism shall contain arc chutes to suppress arcs and cool vented gases. Breaker cubicles shall not require "flash shields".
3. Inter-phase barriers of insulating material shall isolate each breaker pole.
4. The breaker front shall have standard padlocking provisions to lock the breaker open and mechanically trip-free. The padlock provision shall accept up to three padlocks with one-quarter to three-eighth inch diameter shanks.
5. Each draw-out breaker shall have provisions for up to 72 dedicated secondary disconnects.
6. All breaker control circuits and trip unit inputs / outputs shall be wired through the secondary disconnects.
7. Secondary disconnects shall be self-aligning. They shall automatically couple with mating points in the breaker cubicle with the breaker in the "test' or 'connect' position.
8. Circuit breakers shall have a rejection system that will only allow breakers of the correct ampere rating to be installed in the cubicle. A breaker with a higher short circuit rating may be mounted in the cubicle, if it has the same frame rating. Integrally fused breakers shall not be allowed to be mounted in cubicles for non-fused breakers.
9. Breakers shall have a rugged guide bar that ensures alignment of primary and secondary disconnects as the breaker is racked into the 'test' or 'connect' position.
10. Draw-out breakers shall have wheels to allow rolling the breaker into the cubicle, once it is installed on the draw-out rails.
11. Complete breaker operating status shall be available at the front of the breaker. Indicators in the breaker escutcheon shall provide closing spring status (charge / discharge), breaker main contact status (open / closed) and breaker draw-out position (connect / test / disconnect).

12. Circuit breakers shall be rated to carry 100 percent of the breaker current rating continuously. Provide breakers with current ratings as indicated on drawings.
13. Minimum interrupting ratings shall be as shown on the drawings.
14. Circuit breakers shall have true 30-cycle withstand capability equal to the breaker short time interrupting rating.
15. The circuit breaker shall not have a hidden instantaneous or a making current release to achieve short time withstand ratings.
16. Control voltage for electrically operated breakers 120 volts AC unless indicated otherwise on drawings.
17. Provide a true two-step, stored energy mechanism which shall provide quick-make and quick-break operation, including charge-after-close operation.
18. Closing springs shall be able to be discharged without closing main contacts.
19. Maximum closing time shall be 5 cycles at nominal control voltage.
20. Each breaker shall have a flush-mounted, retractable charging handle and close / open pushbuttons. The handle shall be able to completely charge an electrically operated breaker, if control power is lost during the charging operation.
21. All manual charge / close / open control operators shall be accessible from the breaker cubicle front with the breaker installed and the cubicle door closed.
22. Mechanical interlocks shall prevent moving the breaker from the 'connect', 'test', or 'disconnect' position unless the main breaker contacts are open.
23. The breaker shall be prevented from closing during any racking operation and shall remain trip free except in the 'test' or 'connect' position.
24. A mechanical interlock shall discharge the energy in the closing springs before the breaker is withdrawn from the cubicle.
25. The 'test' position shall permit operating the breaker while disconnected from power circuits.
26. Breaker digital electronic trip units shall be as described in paragraph 2.05.

D. Individually Mounted Fusible Switches
1. Bolted Pressure Switches shall be butt type contact construction with multiple, spring-loaded main arms and an arcing arm per pole. An over-center toggle mechanism shall provide quick make, quick break operation.
2. Switches shall have a molded insulating case and cover with integrally molded interphase partitions. All current carrying parts shall be silver plated copper.
3. Fusible switches shall be equipped with mounting provisions for UL class L fuses. Switches shall have an interrupting rating of 200 KAIC RMS SYM at 600V when used with class L fuses. Provide a complete set of UL class L fuses for each switch. (K rated when feeding a motor)
4. Switches shall be rated for making and breaking 12 times nameplate rated current at 600 VAC. Switches shall be rated to carry 100 percent of their frame ampacity continuously.
5. Switches shall be manually operated and stationary mounted. Switches shall have a front mounted operating handle for charging the closing springs and closing the switch and a push-button for opening the switch. Switches shall include a visible external ON - OFF indicator.
6. Switches shall have defeatable, front access, coin proof interlocks. Interlocks shall prevent opening switch door when switch is ON and prevent turning switch ON when door is open. Switches shall include provisions for padlocking the switch in the open position.

2.05 CIRCUIT BREAKER TRIP UNITS

A. Provide power management digital electronic trip unit for main and tie circuit breakers and feeder protection digital electronic trip unit for feeder circuit breakers as indicated on drawings and as specified below.

B. The trip unit shall provide protection from overload, short circuit, ground fault, and other optional functions as indicated on the drawings or specified. The protective trip unit shall consist of a solid state, microprocessor based programmer; tripping means; current sensors; power supply and other devices as required for proper operation.

C. As a minimum, the trip unit shall have the following protective functions:
   1. Adjustable current setting or long time pickup
   2. Adjustable long time delay
   3. Adjustable instantaneous pickup (Shall have OFF-ON function so it can be turned off for normal operation and on for maintenance to reduce ARC FLASH hazards)
   4. Adjustable ground fault pickup and delay with a switchable I2t ramp
      a. When used on emergency systems, provide ground fault alarm
      b. Do not provide ground fault on 120/208 volt systems
      c. Adjustable short time pickup and delay with a switchable I2t ramp

D. As a minimum, the trip unit shall include the following features:
   1. Long time and short time protective functions, shall have true RMS sensing technology
   2. Ground fault protective function, if provided, shall contain a memory circuit to integrate low level arcing fault currents with time, to sum the intermittent ground fault spikes
   3. High contrast liquid crystal display (LCD) unit shall display settings, trip targets, and the specified metering displays
   4. Multi-button keypad to provide local setup and readout of all trip settings on the LCD
   5. UL Listed interchangeable rating plug. It shall not be necessary to remove the trip unit to change the rating plug
   6. An integral test jack for testing via a portable test set and connection to a battery source
   7. A mechanism for sealing the rating plug and the trip unit
   8. Noise immunity shall meet the requirements of IEEE C37.90
   9. Display trip targets for long time, short time, and ground fault, if included

E. The feeder protection trip unit shall include the following metering functions, which shall be displayed on the LCD (if the manufacturers trip unit cannot incorporate the specified functions, separate device(s) with equal functions shall be provided for each breaker):
   1. Current, RMS, each phase

F. The main and tie breaker power management trip unit shall include the following metering functions, which shall be displayed on the LCD (if the manufacturers trip unit cannot incorporate the specified functions, separate device(s) with equal functions shall be provided for each breaker):
   1. Current, RMS, each phase
   2. Voltage, RMS, line - to - line, or line - to - neutral

3. Energy, KWH, total
4. Demand KWH, over an adjustable time period of 5 to 60 minutes
5. Peak demand, KW, user resettable
6. Real power, KW, line - to - line, line - to - neutral
7. Total (apparent) power, KVA, line to - line, line - to - neutral

2.06 WIRING

A. All control wire shall be type SIS. Control wiring shall be #14 AWG for control circuits, #12 AWG for close, trip, and potential transformer circuits, and #10 AWG for current transformer circuits. Ring type terminals shall be used on all CT, PT, close, and trip circuits. Wire bundles shall be secured with nylon ties and anchored to the assembly with the use of pre-punched wire lances or nylon non-adhesive anchors. All current transformer secondary leads shall first be connected to conveniently accessible shorting terminal blocks before connecting to any other device. Shorting screws with provisions for storage shall be provided. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips and provisions for #10 AWG field connections. Each control wire shall be marked to the origin zone/wire name/destination zone over the entire length of the wire using a UV cured ink process. Provide wire markers at each end of all control wiring. Plug-in terminal blocks shall be provided for all shipping split wires. Terminal connections to remote devices or sources shall be front accessible via doors above each circuit breaker.

B. Furnish fuse holders in switchgear when required.

C. Terminal blocks for external connections shall be heavy duty, molded, one-piece type, rated 600 volts, 50 amperes.

D. Terminal blocks shall be mounted in the rear cable compartment, easily accessible, away from the runbacks and cable terminals.

E. Furnish a bolted steel cover to enclose the terminal blocks.

F. NEMA 2-hole, long barrel crimp- type lugs shall be provided for all line and load terminations suitable for copper cable rated for 90 degrees C of the size indicated on the drawings.

G. Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.

H. Insulated, locking spade terminals shall be used on all #14 AWG terminations.

I. Insulated, ring terminals shall be used on all #12 and # 10 AWG terminations.

2.07 ACCESSORIES

A. Fuses
1. Manufacturer: Gould - Shawmut (or equal).
2. Interrupting Rating of all fuses shall be 200,000 RMS amperes.

B. Individually Mounted Fusible Switch Accessories
   1. Provide the following UL listed accessories where indicated on the drawings:
      a. 120 VAC Electric trip and control power transformer
      b. Blown - fuse Protector
      c. Provision for Key Interlock
      d. Auxiliary Switches with one single-pole, double-throw elements
      e. Integral, self-powered ground fault protection relay with mechanical ground fault indicator, test function, adjustable current pick - up and time delay, and current sensors as required. Ground fault relay shall have an internal memory circuit that integrates intermittent arcing ground faults with time.

C. Furnish nameplates for each device as indicated in drawings. Color schemes shall be as indicated on drawings.

D. Provide Transient Voltage Surge Suppression system where indicated on drawings and as specified in Section 26 43 13.

2.08 FACTORY TESTING

A. Perform all tests recommended by NEMA, IEEE and ANSI standards

B. Perform complete operational checkout of all functions.

2.09 FINISH

A. All steel surfaces shall be chemically cleaned prior to painting.

B. Exterior paint color shall be ANSI 61 Light Gray over phosphate - type rust inhibitor.

PART 3 EXECUTION

3.01 EXAMINATION

A. The following procedures shall be performed by the Contractor:
   1. Examine installation area to ensure there is enough clearance to install switchboard.
   2. Check concrete pads for uniformity and level surface.
   3. Verify that switchboards are ready to install.
   4. Verify field measurements are as shown on Drawings.
   5. Verify that required utilities are available, in proper location and ready for use.
   6. Beginning of installation means installer accepts conditions.

3.02 INSTALLATION

A. Contractor shall furnish and completely install all switchgear as shown on drawings and per manufacturer's instruction books

B. Install required safety labels including arc flash requirements.

C. All necessary hardware to secure the assembly in place shall be provided by the Contractor.

D. The equipment shall be installed and checked in accordance with the manufacturer's recommendations. This shall include but is not limited to the following:
   1. Checking to ensure that all relays and/or protective devices are set properly
   2. Checking to ensure that the pad location is level to within 0.125 inches per three foot of distance in any direction
   3. Checking to ensure that all bus bars are torqued to the manufacturer's recommendations
   4. Assembling all shipping sections, removing all shipping braces, and connecting all shipping split mechanical and electrical connections
   5. Securing assemblies to foundation or floor channels
   6. Measuring and recording Megger readings phase-to-phase, phase-to-ground, and neutral-to-ground (four wire systems only).
   7. Measuring and recording the impedance of the equipment to the building grounding electrode.
   8. Inspecting and installing all circuit breakers in their proper compartments.

3.03 FIELD QUALITY CONTROL

A. Inspect installed switchboards for anchoring, alignment, grounding, and physical damage.

B. Check tightness of all accessible electrical connections with a calibrated torque wrench. Minimum acceptable values are as specified in manufacturer's instruction manual.

C. Check any key interlock system for proper functioning.

3.04 ADJUSTING

A. Refer to manufacturer's instruction book to make adjustments to circuit breakers, doors, handles, etc., as required.

B. Set trip units as per engineer's recommendations.

3.05 FIELD TESTING

A. Perform all tests required and/or recommended by the commissioning specification, NETA, ANSI standards, and the manufacturer.

B. Perform complete operational checkout of all functions.

C. Perform primary injection current testing of all circuit breakers 400 amperes and larger to ensure proper settings and tripping functions.

3.06 CLEANING

A. Clean interiors of switchgear to remove construction debris, dirt, and shipping materials.

B. Repaint scratched or marred exterior surfaces to match original finish.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide circuit breaker type panelboards as indicated on drawings and as specified hereinafter.

1.02 RELATED SECTIONS

A. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables

B. Section 26 05 26: Grounding and Bonding for Electrical Systems

C. Section 26 05 53: Identification for Electrical Systems

D. Section 26 05 73: Power System Studies

1.03 REFERENCES

A. UL 67 Panelboards

B. UL 50 Cabinets and Boxes

C. NEMA PB 1

D. Federal Spec W-P-115C

1.04 SUBMITTALS

A. Submit the following product data for review:
   1. Shop drawings showing circuit breaker or fusible switch layout, dimensions, voltage, phasing, continuous current capacity, short circuit rating, series rating (if applicable)
   2. Conduit entry location, cable termination sizes, mounting

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D

B. General Electric

C. Eaton/Cutler-Hammer

D. Siemens Energy and Automation

2.02 PANELBOARD TYPES

A. Circuit breaker type lighting and appliance panelboards for 120/208 volts, 3-phase, 4-wire service shall be equipped with circuit breakers having AIC ratings as indicated on the drawings, but not less than 10,000 AIC. Panelboards shall be equal to:
   1. Square D, "N" series
   2. General Electric, type AQ
   3. Eaton/Cutler-Hammer, type PRL1A
   4. Siemens, type P1

B. Circuit breaker type lighting and appliance panelboards for 277/480 volts, 3-phase, 4-wire service shall be equipped with circuit breakers having AIC ratings as indicated on the drawings, but not less than 14,000 AIC. Panelboards shall be equal to:
   1. Square D, "N" series
   2. General Electric, Type AE
   3. Eaton/Cutler-Hammer, type PRL2A
   4. Siemens, type P2

C. Circuit breaker type power distribution panelboards for 120/208 volts, 3-phase, 4-wire service shall be equipped with circuit breakers having AIC rating as indicated on the drawings. Where AIC ratings are not shown on drawings obtain the rating requirements from the Architect. Panelboards shall be equal to:
   1. Square D, "I-Line" series distribution type
   2. General Electric, "Spectra" series distribution type
   3. Eaton/Cutler-Hammer, "PRL4B" distribution type
   4. Siemens, type P4 or P5, depending upon panelboard ampacity

D. Circuit breaker type power distribution panelboards for 277/480 volts, 3-phase, 4-wire service shall be equipped with circuit breakers having AIC rating as indicated on the drawings. Where AIC ratings are not shown on drawings, obtain the rating requirements from the Architect. Panelboards shall be equal to:
   1. Square D, "I-Line" series distribution type
   2. General Electric, "Spectra" series distribution type
   3. Eaton/Cutler-Hammer, "PRL4B" distribution type
   4. Siemens, type P4 or P5 depending upon panelboard ampacity

E. Where a power study is required by other sections and the results indicate that higher AIC ratings are required than shown on drawings, furnish panelboards and circuit breakers with AIC ratings in accordance with the power study.

F. Fusible switch type power distribution panelboards shall be Square D type QMB, Eaton PRL4F, GE Spectra Series and Siemen type P4/P5.

G. Provide fuses for fusible switch type distribution panelboards as specified in 26 05 00 and as shown on drawings. Provide R-clips in switches where Class R fuses are used.

H. Bus bars shall be copper.

I. Power distribution panelboards shall be a minimum 36" in width.

J. Power distribution panelboards shall be furnished with full-height bussing.

2.03 REQUIRED FEATURES

A. Provide circuit breakers with lugs (both main and branch circuit lugs) suitable and UL listed for both aluminum and copper conductors and rated for minimum 75 degrees C.

B. Provide electrically isolated factory installed neutral bus.

C. Provide a second, fully rated electrically isolated factory installed, neutral bus where called for on the drawings.

D. Provide separate ground bars complete with lugs or connectors on bar. Provide an additional copper isolated/insulated ground bar where indicated on drawings.

E. Panelboard assembly shall be enclosed in a steel cabinet. The size of the wiring gutters shall be in accordance with U.L. Standard 67. Fronts shall have door with matching trim, be of code gauge full finished steel with rust inhibiting primer and baked enamel finish.

F. Cabinets shall be equipped with spring latch and tumbler lock on door of trim. Doors over 48" long shall be equipped with three point latch and vault lock. All locks shall be keyed alike.

G. Surface mounted panelboards shall be provided with hinged trims such that devices, lugs, and gutters may be exposed without completely removing trim. Flush mounted panelboards shall have "easy-to-remove" trims.

H. Provide thermal magnetic circuit breakers which are fully rated and temperature rated for a 40 degrees C ambient. Breakers shall be quick-make, quick-break type with trip indication shown by handle position other than ON or OFF and with a common trip on all multi-pole breakers.

I. Refer to drawings for numbers of branch circuits, their ratings, number of poles and arrangements.

J. Surfaces of the enclosure and trim shall be properly cleaned and painted gray, ANSI 61.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install per manufacturer's recommendations and contract documents.

B. Ground separate ground bars to panel boxes and to the main service entrance ground bus with a code-sized equipment grounding conductor installed in the same conduit as the phase and neutral conductors.

C. Install circuits using a common neutral in accordance with the National Electrical Code.

D. Provide six circuit breaker handle lock-on devices for each branch-circuit panelboard, installed as directed by Owner's Representative, to prevent unauthorized personnel from turning off circuits to controls, unit heaters, clocks, night lights. Turn spare lock-on devices over to the Owner's Representative.

E. Provide typed directory cards under plastic on the doors of branch circuit panelboards. Directories shall indicate devices being served including space numbers or space names in which devices or fixtures are located. Space names and numbers shall match the graphics installed if different from the space names and numbers on the drawings.

F. Provide shunt trip circuit breakers for kitchen equipment branch circuits under range hoods.

G. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacturer's recommendations.

H. Check all installed panels for proper grounding, fastening, and alignment.

I. Remove debris from panelboards and wipe dust and dirt from all components.

J. Repaint marred and scratched surfaces with touch-up paint to match original finish.

K. Where panelboards are installed flush mounted, provide a minimum of (6)-1" spare conduits stubbed out above ceiling for future use by owner.

L. Where multiple panels are flush mounted in public areas, provide enclosures and trims of matching dimensions.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide switches, receptacles, and other wiring devices as indicated on drawings.

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Arrow Hart

B. Eagle

C. Hubbell

D. Leviton

E. Pass and Seymour

F. Novitas, Inc

G. Hubbell numbers are used unless otherwise noted, but products of equivalent quality by named manufacturers will be acceptable.

2.02 DEVICE COLORS

A. Provide IVORY colored devices where available, unless otherwise noted.

B. Provide RED colored devices where available when connected to the emergency power system, unless otherwise noted.

2.03 SWITCHES

A. 15-Amp, 120/277 VAC, Heavy Duty Specification Grade:
   1. Single pole toggle: Hubbell No. HBL1201
   2. Three-way toggle: Hubbell No. HBL1203
   3. Single pole toggle, weatherproof: Hubbell No. HBL1201 with Hubbell No. HBL1795 weatherproof plate
   4. Single pole toggle with pilot light (120 VAC): Hubbell No. HBL1201IL

B. 20-Amp, 120/277 VAC, Heavy Duty, Specification Grade:
   1. Single pole toggle: Hubbell No. HBL1221
   2. Three-way toggle: Hubbell No. HBL1223
   3. Single pole toggle, weatherproof: Hubbell No. HBL1221 with Hubbell No. HBL1795 weatherproof plate
   4. Single pole toggle with pilot light (120 VAC): Hubbell No. HBL1221IL

C. Occupancy Sensor Switches, 120/277 VAC:
   1. Wall mounted, automatic on/manual on, passive infrared with ambient light sensing, minimum 1000 s.f. room coverage and 500 s.f. desktop activity coverage, 800 W @ 120V and 1200 W @ 277V: Leviton No. ODS10-ID
   2. Ceiling Mounted, 360 Degrees, 1,500 square feet coverage area - Leviton OSC15-10W

2.04 RECEPTACLES

A. 15-Amp, 125 VAC, Heavy Duty, Specification Grade:
   1. Duplex type: Hubbell No. HBL5252
   2. Ground fault circuit interrupter: Hubbell No. GF5262
   3. Duplex, tamper resistant: Hubbell No. HBL8200SG

B. 20-Amp, 125 VAC:
   1. Duplex type: Hubbell No. HBL5352
   2. Ground fault circuit interrupter: Hubbell No. GF5362
   3. Duplex, tamper resistant: Hubbell No. HBL8300SG

C. Weatherproof Type Cover:
   1. Damp location and outdoors protected from weather: Hubbell No. CWP26H
   2. Wet location and outdoors exposed to weather: Hubbell No. WP26MH

D. Miscellaneous Receptacles:
   1. Single 20-amp, 125/250 VAC, 3 pole, 4 wire, NEMA 14-20R: Hubbell No. HBL6810
   2. Single 20-amp, 125/250 VAC, 3 pole, 4 wire, 3 phase, NEMA 15-20R: Hubbell No. HBL8420
   3. Single 30-amp, 125/250 VAC, NEMA 14-30R: Hubbell No. HBL9430A
   4. Single 50-amp, 125/250 VAC, NEMA 14-50R: Hubbell No. HBL9450A

E. Floor Mounted:
   1. Standard Floor Box, 1 to 3 gang:
      a. Cast Iron (slab on grade applications): Walker No. 880CS-1 series
      b. Stamped Steel (elevated slab applications): Walker No. 880S series
      c. Combination Carpet & Tile Flange: Brass - Walker No. 817B (1 gang), Black - Walker No. 817PCC-BLK (1 gang) or Brown - Walker No. 817PCC-BRN (1 gang)
      d. Cover Plate with Flip Lids: Brass - Walker No. 828R (1gang), Black - Walker No. 828PR-BLK (1 gang) or Brown - Walker No. 828PR-BRN (1 gang)
   2. Floor Box, Multi-service, 4 compartment:
      a. Cast Iron (slab on grade applications): Walker No. RFB4-CI-1

b. Stamped Steel (elevated slab applications): Walker No. RFB4
c. Flanged Cover and Trim Ring: Walker No. S36CCTC with Aluminum, Black or Brass finish

3. Furniture Feed, fire-rated, poke-thru device for power and voice/data service:
   a. Service Fitting: Hubbell No. FRF3
   b. Through-Floor Fitting: Hubbell No. PT73SD
   c. Finish Color: Gray or Ivory
4. Pedestal type, 2 gang, fire-rated poke-through device for power and voice/data:
   a. Pedestal Housing and Faceplates: Hubbell No. FR280 / SS2309D / SS2309SL
   b. Through-Floor Fitting: Hubbell No. PT27A

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Mounting:
   1. Mount switches 46" above the finished floor to center line of switch unless noted otherwise.
   2. Mount receptacles 18" above the finished floor to center line of receptacle unless noted otherwise.
   3. Install receptacles shown on the drawings as "special mounting height" at mounting height indicated on drawings. Where no mounting height is given and receptacles are above counters, mount receptacles with centers 4" above top of counter. If the counter has a backsplash, receptacles shall be mounted with centers 4" above top of backsplash. Where special mounting height receptacles are not above counters and no mounting height is indicated, receptacle mounting heights shall match adjacent light switches or above counter receptacles. Coordinate the installation of all special mounting height receptacles with architectural design.
   4. Work devices to nearest block course using proper type outlet boxes as specified under Section 26 05 35. Check architectural and furniture drawings for counter (desk, special booth, etc.) locations. Mount devices above work counters. Verify other special mounting conditions and locate devices as required.

B. Polarity: Wire receptacles so that the hot wire, neutral wire and ground wire connect to the proper terminals.

C. Grounding: Install a No. 12 green ground wire from device grounding terminal back to grounding bus in panelboard, as noted on drawings.

D. Install floor boxes or poke-through fittings where shown on drawings with receptacle and/or communication outlet quantities as shown on drawings.
   1. Install one 3/4" conduit from power compartment to a junction box above accessible ceiling for each floor box. Box configuration to allow interconnection from end power compartment to opposite end power compartment.
   2. Install one dedicated 1" conduit from each communications compartment, stubbed out above accessible ceiling for each floor box.

E. Install receptacles with ground pin up.

F. For GFCI receptacles, do not utilize feed-thru feature, unless required by drawings.

G. A single receptacle installed on an individual branch circuit shall have an ampere rating of not less than that of the branch circuit.

END OF SECTION

SECTION 26 27 27

WIRING DEVICE PLATES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide device plates on switches, receptacles, telephone outlets and miscellaneous devices.

1.02 RELATED SECTIONS

A. Section 26 27 26: Wiring Devices

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide specification grade stainless steel device plates from the wiring device manufacturer.

B. Provide specification grade nylon device plates from the wiring device manufacturer. Provide device plates in colors to match the associated devices.

C. Provide cast alloy or stamped metal plates on exposed switches and receptacles.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install device plates in full contact with wall surface. Plates shall not project out from the wall.

B. Install device plates in full contact with surface mounted box. Plates shall not project out from the edge of the box.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide horsepower rated, quick-make, quick-break, safety switches with the number of poles and fuses as required. For 240 volt switches use general duty type. For 600 volt switches, use heavy duty type. Provide Class R fuse in clips in each type.

C. Switches shall have arc shields, be of enclosed construction and fusible or non-fusible as indicated. Switches shall be rated for either 240-volt AC or 600-volt AC service as required.

D. Switches shall be capable of interrupting locked rotor currents of motors which they serve.

E. Switches shall have UL listed lugs suitable for 75deg.C copper or aluminum conductors.

F. Switches shall be pad lockable in the open (off) position.

G. Fusible switches shall have a UL listed short circuit rating of 100,000 amps rms with fuses applied.

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D

B. General Electric

C. Eaton/Cutler-Hammer

D. Siemens Energy Automation

E. Provide Square D Series HU-660, six-pole safety switches for part-winding or two-speed motors requiring remote disconnects.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Provide non-fused switches at remote motor locations (rain-tight where required) as indicated on drawings and as required by NEC. Do not use if fault current exceeds 10,000 amperes.

B. Identify safety switches with Bakelite nameplates in accordance with Section 26 05 00.

C. Use NEMA 1 for interior use and NEMA-3R for exterior use.

D. Provide two normally open and two normally closed auxiliary contacts for disconnect switches used to serve fan system motors including supply fans, return air fans, exhaust fans, make up air fans, and relief air fans for electrical interlock with mechanical control circuits.

E. Switches used for service equipment shall be Heavy Duty type, UL listed for service equipment use.

END OF SECTION

SECTION 26 29 13

MOTOR STARTERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Motor starters

B. Provide wiring in accordance with Section 26 05 00.

1.02 RELATED SECTIONS

A. Division 23: HVAC

B. Section 26 05 19: Low Voltage Electrical Power Conductors

C. Section 26 05 33: Raceways and Conduit Systems

D. Section 26 05 53: Identification for Electrical Systems.

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 STARTERS

A. Design: NEMA standard, UL listed and CSA approved.

B. Ratings: A/C symmetrical ratings of 50,000 amps for 460 volt equipment and 35000 amps for equipment of lower voltages. Provide higher ratings where available fault current exceeds these ratings and as called for on drawings.

C. Size: In accordance with NEMA standards.

D. Acceptable manufacturers: Allen Bradley, Square D, Eaton, General Electric.

E. Starters shall include melting alloy overloads in each phase, and auxiliary interlocks as required for proper system operation.

F. Provide starters mounted in NEMA 1 general purpose enclosures, unless location of starter dictates other NEMA enclosure. For example, provide NEMA Type 3R enclosures for outdoor use or NEMA Type 7 enclosures for hazardous areas.

G. Provide Hand-Off-Automatic selector switches in each starter.

H. Provide reduced voltage starters as shown on the drawings.
   1. Auto Transformer: Closed transition, 50%, 65%, 80%, taps, set at 50%
   2. Wye-Delta starters: Closed transition type

I. Provide 120 volt control transformers in each starter, individually fused from the line side of the starter using two cartridge fuses and one fuse in the secondary. Size transformers to carry the holding coil circuit and other connected devices.

J. Provide lockable combination starters with motor circuit protectors sized in accordance with the NEC Article 430.

K. Provide built-in power factor correction capacitors on motors 50 horsepower and larger to correct the power factor to 95%. Connect capacitors between the contactor and overload relays.

L. Pushbutton station, selector switches, and pilot lights:
   1. Oiltight, manufacturer's standard unit
   2. Pushbutton station: Momentary contact type with green start button, red stop button, and legend plate
   3. Selector switches: Standard knob maintained contact type with legend plate
   4. Pilot lights: 120 volt lamps with green glass color cap

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install motor starters in accordance with manufacturer's recommendations and requirements of NEC.

B. Provide thermal overloads at system startup in accordance manufacturer's recommendation for specific application.

C. Connect Divisions 21, 22, and 23 equipment ready for operation.

D. Coordinate equipment locations and starter sizes with Divisions 21, 22 and 23 Contract Documents, submittals, and shop drawings.

E. Verify phase rotation of motors with Divisions 21, 22 and 23.

F. Identify starters and controls as required by Section 26 05 00.

END OF SECTION

SECTION 26 41 13

LIGHTNING PROTECTION SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide labor, materials and equipment required for completion of a functional system of air terminals, conductors, grounds, and other components necessary for protection against damage by lightning.

C. System shall be concealed, with only air terminals and roof conductors visible.

D. Provide a UL Inspection Certificate upon completion of work.

1.02 RELATED SECTIONS

A. Division 07: Roofing and flashing.

B. Section 26 05 26: Grounding and Bonding for Electrical Systems

1.03 REFERENCES

A. The lightning protection system shall comply with the latest issue of the following standards.
   1. NFPA 780 Standard for the Installation of Lightning Protection Systems
   2. UL 96A Installation Requirements for Lightning Protection Systems
   3. LPI-175 Lightning Protection Institute

1.04 SUBMITTALS

A. Provide shop drawings, list of material, and details to Engineers for approval prior to commencement of the installation. The drawings shall show the extent of the system layout designed specifically for the contract project.

1.05 QUALITY ASSURANCE

A. The installation shall be by a UL listed installer.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers:
   1. Heary Brothers Lightning Protection, Inc.
   2. Thompson Lightning Protection, Inc.
   3. Robbins Lightning Protection, Inc

4. Harger Lightning & Grounding

2.02 MATERIALS

A. All materials used in the installation shall be new and shall comply in weight, size and composition as required by UL 96A and NFPA 780 and shall be labeled or listed by Underwriters Laboratories Inc. for use in lightning protection systems. The system furnished under this specification shall be the standard product of a manufacturer regularly engaged in the production of lightning protection equipment. The manufacturer shall be listed by UL as a recognized manufacturer of lightning protection components.

B. Class I materials shall be used on structures that do not exceed 75 feet in height and Class II materials shall be used on structures that are 75 feet or higher above average grade.

C. Copper materials shall not be mounted on aluminum surfaces including Galvalume, galvanized steel and zinc; this includes these materials that have been painted.

D. Aluminum materials shall not come into contact with earth or where rapid deterioration is possible. Aluminum materials shall not come into contact with copper surfaces.

2.03 AIR TERMINALS

A. Air terminals shall project a minimum of ten inches above the object or area it is to protect and shall be located at intervals not exceeding 20'-0" along ridges and along the perimeter of flat or gently sloping roofs (flat or gently sloping roofs include roofs that have a pitch less than 3:12). Flat or gently sloping roofs exceeding 50'-0" in width shall be protected with additional air terminals located at intervals not exceeding 50'. Air terminals shall be located within two feet of roof edges and outside corners of protected areas.

B. Air terminals shall be installed on stacks, flues, mechanical units and other metallic objects not located within a zone of protection and which have an exposed metal thickness less than 3/16 of an inch. Objects having an exposed metal thickness 3/16 of an inch or greater shall be connected to the lightning protection system as required by the specified standards using main size conductor and bonding plates having a minimum of 3 square inches of surface contact area.

C. Air terminal bases shall be securely fastened to the structure in accordance with the specified standards including the use of adhesive that is compatible with the surface it is to be used on or stainless steel fasteners.

D. Main conductors shall be sized in accordance with the specified standards for Class I or Class II structures and shall provide a two way horizontal or downward path from each air terminal to connections with the ground system. Conductors shall be free of excessive splices and no bend of a conductor shall form a final included angle of less than neither 90 degrees nor have a radius of bend less than 8 inches.

E. Down conductors shall be sized in accordance with the specified standards and in no case shall be smaller than the main roof conductor. Down conductors shall be spaced at intervals averaging not more than 100 feet around the perimeter of the structure. In no case shall a structure have fewer than two down conductors. Where down conductors are

installed exposed on the exterior of a structure and are subject to physical damage or displacement, guards shall be bonded at each end.

F. In case of structural steel frame construction, down conductors may be omitted and roof conductors shall be connected to the structural steel frame at intervals not exceeding 100 feet along the perimeter of the structure.

2.04 ROOF PENETRATIONS

A. Roof penetrations required for down conductors or for connection to structural steel framework shall be made using thru-roof assemblies with solid riser bars and appropriate roof flashing. Conductors shall not pass directly through the roof. The roofing contractor shall furnish and install the materials required to properly seal all roof penetrations of the lightning protection components and any additional roofing materials or preparations required by the roofing manufacturer for lightning conductor runs to assure compatibility with the warranty for the roof including roof pads that may be required to protect the roof under each of the lightning protection components.

2.05 GROUND TERMINATIONS

A. Ground electrodes shall be copper and a minimum 3/4" diameter and 10 feet long. A ground electrode shall be provided for each down conductor. The down conductor shall be connected to the ground electrode using a bronze ground rod clamp having a minimum of 1-1/2" contact between the ground electrode and the conductor measured parallel to the axis of the ground electrode, or by an Ultraweld exothermically welded connection. Ground electrodes shall be located a minimum of 2 feet below grade and shall be installed below the frost line where possible (excluding shallow topsoil conditions).

B. Where the structural steel framework is utilized as the down conductor for the system, ground terminals shall be connected to columns around the perimeter of the structure at intervals averaging not more than 60 feet apart. Columns shall be grounded using either bonding plates have 8 square inches of surface contact area or by Ultraweld exothermically welded connections.

C. All ground electrodes shall be interconnected with a ground loop conductor on structures that exceed 60 feet in height. The ground loop conductor shall be sized in accordance with the specified standards and in no case shall be smaller than the main roof conductor.

2.06 EQUIPOTENTIAL GROUNDING

A. Common interconnection of all grounded systems within the building shall be ensured by interconnecting to the lightning protection system using main size conductor and fittings.

B. This interconnection shall include but is not limited to the electrical service, telephone and antenna system grounds as well as all underground metallic piping systems including water, gas and sewer. Interconnection to a gas or water line shall be made on the customer's side of the meter. Connection to gas line must be approved by the gas utility.

C. Grounded metal bodies located within the required bonding distance as determined by the bonding distance formula in the latest edition of NFPA-780 Standard for the Installation of

Lightning Protection Systems shall be bonded to the lightning protection system using the required bonding conductors and connections.

2.07 SURGE PROTECTION

A. Surge suppression shall be provided at all power service entrances and at entrances of conductive signal, data and communication services.

PART 3 EXECUTION

3.01 INSTALLATION

A. The installation shall be installed by an UL listed lightning protection installation company that is licensed as a lightning protection installer in the project state.

3.02 COORDINATION

A. Coordinate the installation of the lightning protection system with other trades.

B. Coordinate all roof penetrations, fasteners and adhesive with the roofing contractor prior to installing any materials on the roof.

3.03 INSPECTION AND CERTIFICATION

A. New Structures
   1. Upon completion of the installation of the lightning protection system the contractor shall furnish the UL Certificate of Compliance issued by Underwriters Laboratories Inc.

B. Additions or Renovations
   1. If the protected structure is an addition to or is attached to an existing structure that does not have a functioning lightning protection system, the contractor shall certify that the new system installed complies with the specified standards and shall advise the owner on the lightning protection work required on the existing structure so that a Certificate of Compliance may be obtained.
   2. If the protected structure is an addition to or is attached to an existing structure that does have a lightning protection system the contractor shall advise the owner of any additional work that may be required in order to bring the existing lightning protection system into compliance with the specified standards and thus qualify for a Certificate of Compliance from Underwriters Laboratories Inc.

END OF SECTION

SECTION 26 43 13

TRANSIENT VOLTAGE SURGE SUPPRESSION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with provisions of Sections 26 05 00.

B. Provide three phase surge protection devices (TVSS) as shown on the drawings having the electrical characteristics, ratings and modifications as specified herein.

1.02 RELATED SECTIONS

A. Section 26 05 19: Low Voltage Electrical Power Conductors

B. Section 26 05 26: Grounding and Bonding for Electrical System

C. Section 26 05 33: Raceways and Conduit Systems

D. Section 26 24 13: Switchboards

E. Section 26 24 16: Panelboards

1.03 REFERENCES

A. ANSI/IEEE C62.11 - Standard for Metal-Oxide Surge Arresters for AC Power Circuits

B. ANSI/IEEE C62.33 - Standard Test Specifications for Varistor Surge Protection Devices

C. ANSI/IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Systems

D. ANSI/IEEE C62.45 - IEEE Standard Guide on Surge Testing for Equipment Connected to Low -Voltage AC Power Circuits

E. NEMA Standard LS-1 - Low-Voltage Surge Protective Devices

F. NFPA 70 - National Electrical Code

G. UL 1283 - UL Standard for Safety Electromagnetic Interference Filters

H. UL 1449 - UL Standard for Safety Transient Voltage Surge Suppressors

1.04 SUBMITTALS

A. Submit product data sheets and descriptive bulletins including proof of the following listings:
   1. UL 1283 listing

2. UL 1449 2nd Edition listing
3. Manufacturer ISO 9000 - 2001 certification.

B. Voltage Clamping TVSS devices
1. Submit test data of actual let through voltage for the ANSI/IEEE C62.41, table 4, location category B3/C1 at the 90 degree phase angle tested in accordance with NEMA LS-1 for L-L, L-N, L-G, N-G from a recognized independent testing laboratory.
2. Provide a complete diagram of all devices used in the test including lengths of conductors and where voltages were measured.

C. Sine Wave Tracking TVSS devices
1. Submit test data of actual let through voltage for the ANSI/IEEE C62.41, table 3, location category A1 at the 90 degree phase angle for L-L, L-N, L-G, N-G from a recognized independent testing laboratory.
2. Provide a complete diagram of all devices used in the test including lengths of conductors and where voltages were measured.

D. Provide electrical/mechanical drawings showing the unit dimensions, weights, installation instruction details and wiring configuration for retrofit mounting applications.

PART 2 PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. TVSS Equipment Ratings
1. Provide equipment with AIC rating equal to or greater than the fault current available at the equipment being protected. (Refer to drawings)
2. Provide equipment with each mode rated for the following surge current levels appropriate to the capacity of the equipment being protected:
a. 600-A Bus or less: 120,000-amps service entrance equipment
b. 600-A Bus or less: 40,000-amps non-service entrance

B. TVSS Performance Requirements
1. Voltage Clamping TVSS Device(s). Install on service entrance equipment and on equipment within 30 linear feet of the service entrance as installed in the field.
a. Provide Voltage Clamping levels equal to or less than the following levels for the Category B3/C1 wave at the 90-degree phase angle measured from zero volts to the peak of the let thru:
1) 480/277-volt three phase "wye"
(a) L-L: 1,020-volts
(b) L-N: 590-volts
(c) L-G: 590-volts
(d) N-G: 1,372-volts
2) 208/120-volt, three phase "wye"
(a) L-L: 735-volts
(b) L-N: 425-volts
(c) L-G: 425-volts
(d) N-G: 595-volts

C. TVSS Features
   1. Provide status indicators for each mode on the face of the TVSS enclosure.
   2. Provide safety labels identifying the equipment, UL label, the AIC rating of the equipment and the modes of protection.
   3. Provide dry contacts for remote monitoring.

D. Provide products from the same TVSS manufacturer.

2.02 ACCEPTABLE MANUFACTURERS

A. Control Concepts (Liebert)

B. Surge Suppression, Inc.

C. Current Technology

2.03 WARRANTY

A. Provide a 10 year warranty including materials from the date of owner occupancy in the event of any evidence of failure of the TVSS system.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Wall or equipment mounted TVSS
   1. Mount all three phase TVSS units adjacent (close nippled) to the switchboard/panelboards being protected in a NEMA 12 enclosure.
   2. Install, connect and ground the TVSS device and enclosure in accordance with the manufacturer's instructions, the National Electrical Code and wiring diagrams shown on the drawings.
   3. Provide a 30/3 branch circuit breaker in each panel to be protected for connection of suppressor to panel bus.
   4. Coordinate dry contact connections with fire alarm or energy management vendor. (Refer to drawings)
   5. Provide #10 minimum THHN wire minimized to maximum length of 18" between the device and the circuit breaker.
   6. Provide manufacturer flush mounting kit where required by drawings.

B. TVSS Mounted Integral to Equipment
   1. Coordinate TVSS equipment installation with switchgear/panelboard vendor.
   2. Provide #10 minimum THHN wire minimized to maximum length of 18" between the device and the circuit breaker.

3. Provide a 30/3 branch circuit breaker in each panel to be protected for connection of suppressor to panel bus.
4. Coordinate dry contact connections with fire alarm or energy management vendor. (Refer to drawings)
5. Place all monitoring diagnostic features on the front face of the switchgear mounted devices.

END OF SECTION

SECTION 26 51 13

INTERIOR LIGHTING FIXTURES, LAMPS AND BALLASTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide labor, material, equipment and fixtures for interior lighting including necessary hangers and lamps. Fixtures shall be completely wired, controlled and securely attached to supports.

C. Fixtures and associated components shall be new, of good quality and shall arrive on the jobsite in original packaging.

D. Fixtures shall be listed by a Nationally Recognized Testing Laboratory, and shall meet required local, state and national building codes and regulations. Luminaries installed in exterior locations, unprotected from precipitation, shall be listed for wet location use. Luminaries installed in protected exterior areas or in interior areas subject to extreme humidity shall be listed for damp location use.

1.02 RELATED SECTIONS

A. Section 26 56 00: Exterior Lighting Accessories

1.03 BIDDING AND SUBSTITUTION

A. Comply with the provisions of Division 01.
   1. Bidders requesting approval of brands other than those specified by name/catalog number in that lighting fixture schedule or these specifications shall submit their requests not later than fifteen (15) business days before the scheduled bid due date. Contractors will be notified of approval in the form of an addendum to the bid documents for those products, which have been approved as equal. The Owner has no obligation to review or consider any substitutions after the bid date or pre-bid review period.
   2. Where indicated on schedule, substitution requests shall be accompanied by a working fixture sample - 120V, complete with lamp and cord/plug. These samples shall be shipped separately with return shipment guaranteed at the bidder's expense to the location designated by the Architect. Additional information, including names of projects and contact information (Owner, and Architect/Lighting Designer) for recently completed installations, will be required for these fixtures. If approved, these sample fixtures may not be installed on the project.

B. Provide unit pricing for each specified or alternate fixture to include lamp, freight, and contractor mark-up.

C. The Contractor shall be provided with entire lighting specification (including fixture illustrations and sketches). Contractor shall provide each specified manufacturer with complete information about the luminaries they will supply.

1.04 SUBMITTALS

A. Submit product data for review.

B. Initial lighting submittal shall be complete, clearly indicating fixture manufacturer, model number, voltage, ballast manufacturer, options, finish, mounting type/special mounting details for each fixture specified on the project. The Architect reserves the right to request a shop drawing where information shown on the catalog cut sheets is incomplete. Partial submittals will not be accepted. Re-submittals, where required, may be partial as determined by the submittal review.

C. Where custom fixtures, or row mounted fluorescent fixtures are required on the project, scaled fabrication drawings shall be submitted which indicate ballast locations, internal fixture wiring, support locations, power feed locations, materials and finishes. Contractor shall provide field dimensions for fabrication as required.

D. Submit lamp product data for each specified lamp type.

E. Fixture details shown on contract documents may be modified by the manufacturer if needed, providing all of the following are met:
   1. Fixture performance is equal or improved.
   2. Structural, mechanical, electrical, safety and maintenance characteristics are equal or improved.
   3. Cost to the Owner is reduced or equal.
   4. Modifications are clearly identified on the fixture submittal for Architect review and approval.

F. Fixture submittals shall be arranged numerically as specified.

1.05 QUALITY ASSURANCE

A. Fixtures and workmanship shall be guaranteed free of defects and fully operational for a minimum of one year after project acceptance by the Owner. Any fixtures or workmanship found to be defective during the warranty period shall be replaced by the contractor at no cost to the owner for labor or materials.

B. Fluorescent ballasts shall have an extended three-year manufacturer's warranty against defects in workmanship or material. HID ballasts shall have a two-year warranty against defects in workmanship or material. Warranty shall include in-warranty service program providing for payment of authorized labor charges associated with the replacement of inoperative ballasts within this warranty period.

PART 2 PRODUCTS

2.01 GENERAL MATERIAL REQUIREMENTS

A. ACCEPTABLE MANUFACTURERS
   1. Fixture Manufacturers shall be as indicated on fixture schedule.
      a. Fluorescent Troffers:
         1) Columbia
         2) Lithonia
         3) LSI/Innovator
         4) Metalux
         5) Williams
         6) Daybrite
      b. Downlights:
         1) Prescolite
         2) Lithonia/Gotham
         3) Spectrum
         4) Omega
      c. Exit Lights and Egress Lights:
         1) Dual-Lite
         2) Lithonia
         3) Emergi-lite
         4) McPhilben

B. Luminarie hardware shall be concealed. Fasteners shall be manufactured of non-magnetic stainless steel or anodized aluminum, except in indoor applications where galvanized steel shall be acceptable.

C. Fixtures shall be free of light leaks and shall be designed to provide sufficient ventilation of lamps and ballasts including vent holes where required. Exterior fixtures shall have wire mesh corrosion resistant screens in the vent holes.

D. Fixture housings for linear fluorescent lamps shall be No. 22 gauge steel, bonderized or equal rust protection, or No. 16 gauge aluminum rigid construction, suitable for continuous row mounting where indicated.

E. Fixture housings for incandescent or HID lamps shall be:
   1. Interior locations
      a. No. 20 gauge steel, bonderized or equal rust protection, or
      b. No. 16-gauge aluminum rigid construction.
   2. Exterior locations
      a. No. 18 gauge steel, bonderized or equal rust protection, or
      b. No. 14-gauge aluminum rigid construction.

F. Fixtures shall be constructed with a minimum number of joints. Exposed metal joints shall be welded, filled with weld material, ground smooth and made free of light leaks. Unexposed joints shall be welded, screwed or bolted. Soldered joints are not acceptable. Self tapping methods or rivets for fastening removable parts used to gain access to

electrical components requiring service or replacement, or for fastening electrical components or their supports, will not be acceptable.

G. Sheet metal work shall be free from tool marks and dents and shall have accurate angles bent as sharp as compatible with the gauges of the required metal. All intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after assembly. Edges shall be finished such that no sharp edges are exposed. Miters shall be in accurate alignment. Sheet metal work shall be properly fabricated so that planes will not deform due to operating and varied weather conditions.

H. Cast or extruded parts of luminaries shall be close grained, rigid, true to pattern, of ample weight and thickness, and properly fitted, filed, ground, and buffed to provide finished surfaces and joints free of imperfections or discolorations.

I. Housings for fluorescent and HID fixtures shall be designed to ensure electrical components are easily accessible and replaceable, without removing the fixture body from its mounting.

J. Finishes
   1. Ferrous mounting hardware and accessories shall be finished using either a galvanic or phosphate primer/baked paint process to prevent corrosion and discoloration of adjacent materials.
   2. For weatherproof and vapor tight installations, painted finishes of fixtures and accessories shall be weatherproof enamel using proper primers or hot dipped galvanized and bonderized epoxy, in accordance with the manufacturer's requirements. Finish of painted surfaces shall have a life expectancy of not less than twenty years.
   3. Finishes for interior luminaries shall be baked enamel unless specified otherwise. Concealed interior and exterior surfaces, including hardware, yokes, brackets, etc., shall be finished matte black.
   4. Pendant hangers, where required, shall be chemically resistant, weatherproof baked enamel finish.
   5. Where aluminum parts come in contact with bronze parts, apply to both surfaces a coating material to prevent corrosion.

K. Fixtures with an adjustable lamp and using a lamp with an asymmetrical light pattern shall have an aiming stop which can be permanently set so that the lamp shall remain correctly positioned after service or relamping.

L. Fixtures shall be designed, manufactured and wired to conform to NEC article 300.22 where the fixtures are recessed in a hung ceiling, and the space above the ceiling is utilized for supply or return air plenum.

M. Incandescent luminaries shall include a thermal protection device as required by NEC 410.65.

2.02 LAMPHOLDERS

A. Lampholders shall be rigidly and securely attached to the luminaire and shall hold lamps securely against normal vibrations and maintenance handling. Lampholders shall be

suitable for specified lamps, and set to position the lamps in optically correct spacing and relationship to lenses, reflectors, filters and baffles.

1. Lampholders for incandescent, HID and halogen lamps shall be porcelain with nickel-plated copper screw shells.
2. Lampholders for pulse-start Metal halide shall be 4 kV pulse-start rated, porcelain with nickel-plated copper screw shells.
3. Lampholders for fluorescent shall be white heat-resistant plastic. Lampholders intended for operation with an open circuit voltage in excess of 300 volts shall be the safety type, designed to open the supply circuit when the lamp is removed from the socket. Where fluorescent lamps are installed in unenclosed fixtures, a minimum of two lamp retaining clips per lamp shall be provided.

2.03 REFLECTORS

A. Reflector Cones:
   1. Provide 45 degree lamp and lamp image cut-off unless otherwise specified. In fixtures where upper reflector is separate from cone, cut-off shall be 45 degrees unless otherwise specified.
   2. Reflector cone retention devices shall not deform the cone in any manner.
   3. Plastic materials shall not be used for reflector cones or aperture plates.
   4. Fixtures, which require pressure to be applied to the finished surface of the reflector in order to remove the reflector, are not acceptable.
   5. Ceiling flange shall be formed as an integral part of the cone or fixture reflector assembly and shall have identical color and finish as the cone, except as scheduled. The flange surface shall be perpendicular to the cone axis and shall be of appropriate width to adequately cover the ceiling opening without light leaks, or visibility of fixture housings.

B. Aluminum Reflectors:
   1. Aluminum reflectors and reflecting cones shall be manufactured of uniform gauge, not less than 0.032" thick, high purity aluminum Alcoa 3002 alloy free of spin marks or other defects or blemishes caused during manufacture. No riveting or springs shall be visible after installation. The reflector inner surface shall have an anodic coating of not less than four mils thick. The inner surface shall be free of water spotting and shall maintain a reflectivity ratio of not less than 83 % on clear specular finish. The reflector shall have a low iridescent finish free from multiple colors seen from normal viewing angles.
   2. Luminaries provided with tri-phosphor type lamps shall be provided with low iridescence aluminum reflectors to eliminate discoloration on aluminum reflectors.
   3. The reflecting surface of the cone shall be tested for proper sealing per ASTM B136-63T.

C. Painted Reflectors:
   1. Painted reflectors shall be formed before application of primer and paint. Finish process for reflectors and reflector cones for luminaries with baked white enamel finish shall meet the following requirements.
      a. After 100 hours of exposure to fade-o-meter, reflectance shall be not less than 85%, and finish shall show no visible color change.
      b. After 100 hours of exposure to 100% humidity at 100 degrees F, finish shall show no blistering or other degraded effects.

c. After 150 hours of exposure to salt spray (20% sodium chloride) shall cause not breakdown of film.

2.04 LENSES

A. Lenses, louvers and other light diffusing components shall be contained in frames. Components shall be removable but positively held within the frames so that hinging or other motion of the frame will not cause the diffusing component to drop out. This safety device shall be detachable if necessary and shall not interfere with the fixture performance, maintenance, or the seating of any fixture element, and shall not be visible during normal fixture operation.

B. Fresnel:
   1. Lens shall have uniform brightness throughout the entire visible area at angles from 45 degrees to 90 degrees from vertical, without bright spots or striations.
   2. Lens shall have opaque risers - color as specified in schedule.
   3. Finish of visible regress surface of door shall be matte baked enamel paint - color as specified in schedule.

C. Glass:
   1. Flat glass lenses shall be heat tempered borosilicate glass unless otherwise noted.
   2. Provide clear glass safety lens in metal halide fixtures unless noted otherwise.
      a. Glass finish (i.e. sandblasting, etching, polishing) shall be as scheduled.

D. Acrylic:
   1. Lenses shall be of injection molded crystal clear 100% virgin acrylic, .125 thickness.
      a. For lenses with female pattern, specified thickness refers to overall thickness of material. (Example: A12.125 lens refers to a .125 nominal thickness)
      b. For lenses with male pattern of pyramids (cones), specified minimum thickness refers to distance from flat surface to base of pyramids (cones), or thickness of undisturbed material. (Example: A19 lens)
   2. Lenses shall fully eliminate lamp images when viewed from all directions within the 45-degree to 90-degree angle from vertical when the ratio of lamp spacing to the distance from lamp underside to top of lens does not exceed 1.5. Within the viewing angle from 0 to 45 degrees, the ratio of maximum brightness (under a lamp) to minimum brightness (between lamps) shall not exceed 3 to 1.
   3. Lenses shall produce a VCP or at least 65 based on a 30 x 30 room with 80/50/20 reflectances lit to 100 footcandles (verified by and independent laboratory.)
   4. Lenses shall produce no more than 585 footlamberts of brightness in the critical 65-degree zone.
   5. Finishes (i.e., sandblasting, etching, polishing) shall be as scheduled.

2.05 PARABOLIC AND FLAT BLADE LOUVERS

A. Louvers shall be continuously bound in channel formed frame, finish and color as scheduled.

B. Louver shall provide a minimum visual cut-off to the lamp of 45 degrees.

C. The finish of the visible surface of the reflector shall be highly specular as described above for the Alzak process.

D. For flat blade louvers, blade thickness shall be a minimum of .125" flat steel.

2.06 BALLASTS

A. FLUORESCENT
1. Unless indicated otherwise on fixture schedule, linear fluorescent lamp ballasts shall be Instant Start
2. Provide 2, 3 or 4-lamp ballasts as required for the number of lamps in each fixture unless indicated otherwise on drawings. Where dual switching of multiple lamp fixtures is shown on drawings to provide variable light intensities, provide multiple ballasts per fixture as required to accomplish the switching arrangement shown.
3. Acceptable Manufacturers
   a. Instant Start
      1) 20% THD-T8 lamps: Advance REL series (120V), VEL series (277V) or equivalent by Magnetek, Motorola, Osram/Sylvania.
      2) 10% THD-T5/T8 lamps: Advance RCN series (120V), VCN series (277V) or ICN series (dual 120/277V) or equivalent by Magnetek, Motorola, Osram/Sylvania
   b. Programmed Start -
      1) Advance Mark V (2F32T8) RIC-2S32
      2) Advance Centium (2F28T5) RCN-2S28 or equivalent by Magnetek, Motorola, Osram/Sylvania
   c. Rapid Start - 20% THD-T8, T8/HO lamps: Advance GEL series or equivalent by Magnetek, Motorola, Osram/Sylvania
      1) 10% THD-T8 lamps: Advance GCN series or equivalent by Magnetek, Motorola, Osram/Sylvania
   d. Program Rapid Start -
      1) 10% THD-T8 lamps: Advance RCN series (120V), VCN series (277V) or equivalent by Magnetek, Motorola, Osram/Sylvania
   e. Programmed Start Dimming -
      1) (0-10 volt dimming) Advance Mark VII series, Motorola Helios, Lutron Eco-10
      2) (Line Voltage dimming) Advance Mark X series, Lutron Hi-Lume
4. Ballasts shall be high frequency electronic type, and shall operate lamps above 42 kHZ to avoid interference with infrared devices.
5. Ballasts shall operate from 60 Hz input source of 120 or 277 volts and be capable of withstanding sustained variations of +/- 10% in voltage and frequency without damage to ballasts. Ballasts shall tolerate sustained open circuit and short circuit output conditions without damage. Ballasts shall provide transient immunity as recommended by ANSI C62.41.
6. Ballasts shall comply with ANSI C82.11; FCC Part 18 Non-Consumer Equipment, Class A for EMI;
7. Ballasts shall have a Class A+ sound rating.
8. Input current Total Harmonic Distortion (THD) shall not exceed 10% for non-dim primary lamp applications, and 10% for dimming applications.

9. Ballasts shall operate lamps with no visible flicker (<3% flicker index).
10. Minimum ambient temperature for lamp start shall be 0 degrees F.
11. Lamp Current Crest factor shall be 1.7 or less in accordance with lamp manufacturer recommendation for non-dim applications, and 1.6 or less for dimming applications.
12. T8 and T5 Ballasts shall have a Power Factor of .98 or greater for primary lamp applications. Dimming ballasts shall have a Power Factor of .98 or greater at full light output and greater than .90 throughout the dimming range. Compact fluorescent ballasts shall have a Power Factor of .96 or greater.
13. Ballasts shall have a minimum Ballast Factor for primary lamp applications per ANSI C82.11 as listed below:
    a. T8 normal light output: 0.85
    b. T8 low wattage: 0.75
    c. T8 High light output: 1.2
    d. T5 and T5HO: 1.00
    e. Dimming Ballasts with 0-10Volt control: range 0.88-0.05 (100% to 5% relative light output)
    f. Dimming Ballasts with powerline control: range 1.0-0.05 (100% to 5% relative light output)
    g. T4 and T5 Compact fluorescent 13W- 42W: 0.93
14. Compact fluorescent, T5 and T5HO ballasts shall incorporate lamp shutdown circuitry for end of lamp life protection. Ballasts shall allow for relamping without the need to cycle power.
15. Ballasts in exterior fixtures shall be UL935 listed, Class P, Type 1 Outdoor rated.

B. HID
1. CWA
    a. Ballasts shall be designed in accordance with all applicable ANSI specifications including C82.4. Ballasts shall be manufactured in an ISO 9002 and ISO 14001 certified facility.
    b. Core & Coil ballasts shall be designed with class "H" (180 degree) or higher insulation system and vacuum-pressure impregnated with a silica-filled polyester resin.
    c. Core & Coil ballasts shall be designed to operate for 60,000 hours of continuous operation at their maximum rated temperature.
    d. Core & Coil ballast and starter combinations shall be designed to provide a reliable lamp starting down to -40 degrees C for high pressure sodium, and -30 degrees C for metal halide at nominal line voltage +/- 10%.
    e. Ballasts shall have a nominal ballast factor of 1.0.
    f. Ballasts shall completely enclose all live parts.
    g. Ballast igniters shall be designed to provide six months of lamp open circuit operation without failure.
    h. Ballast igniters shall be designed to withstand 10,000 hours of continuous pulsing.
2. Electronic (Pulse Start)
    a. Lamp Current Crest Factor shall be 1.5 or less in accordance with lamp manufacturer recommendation.
    b. Ballast shall tolerate operation of up to 85 degrees C case temperature without damage.
    c. Ballast shall have a nominal ballast factor of 1.0.

d. Input current THD shall not exceed 15% for the primary lamp.
e. Ballasts shall have a power factor greater than .90.
f. Ballast shall have a Class A sound rating. Ballast shall be acoustically isolated from housing using mounting pads to minimize vibration and noise level.
g. Ballast shall be thermally protected and incorporate lamp shutdown circuitry for end of lamp life protection.
h. Ballast shall operate in ambient temperatures as low as -20 degrees F.
i. Ballast shall operate lamps at a frequency of less than 200 Hz to minimize acoustic resonance inside the lamp arc tube and to minimize lamp flicker.
j. Ballast shall be manufactured in an ISO 9002 certified facility.

2.07 FIXTURE WIRING

A. Voltage rating for conductors shall be 300 volts minimum for fixtures designed to operate at 120 Volts or less, and shall be 600 volts minimum for fixtures designed to operate above 120 volts.

B. Wiring shall be code-approved for fixture wiring, and shall comply with the minimum temperature ratings mandated by recognized testing agency.

C. Flexible cord wiring between fixture components or to electrical receptacle, which is not enclosed in wireway, shall have a minimum temperature rating of 105 degrees C. Cord shall be suitable for the application and shall be fitted with proper strain relief and watertight entries where required by the application.

D. Splices within fixtures shall be made within separate splice compartments, and shall utilize nylon insulated crimped connections or quick disconnect devices. Splices to branch circuit shall be made using flame retardant thermoplastic wire nuts with fully seated helical metal spring and threaded entry.

2.08 LAMPS

A. Lamps shall be as indicated on the lighting fixture schedule. Except as specified otherwise, lamps shall be of the same manufacturer throughout the project.

B. A complete set of new lamps shall be provided for each fixture in the project. Where fixtures are installed and utilized for testing before substantial completion, the required set of new lamps shall be installed no earlier than one month before scheduled substantial completion. Contractor shall provide lamps for use if fixtures must be utilized earlier in the project.

C. Fluorescent lamps shall be as manufactured by Philips, Osram/Sylvania or GE. Provide the same lamp color and CRI as indicated below throughout the project except as scheduled otherwise:
1. 3500 degree K, 75 CRI or greater

D. Incandescent Lamps shall be 130 volt rated (Extended / Rough service) operated at 120 volt where available.

E. Metal halide lamps for indoor applications shall include:
   1. Coated type with CRI of 70 or greater with color shift not to exceed +/- 400 degrees K for mogul base, or +/- 200 degrees K for medium base (Equal to GE, Philips, Osram, Venture)
   2. Stabilized color, coated with CRI greater than 80 (Equal to GE ConstantColor, Philips MasterColor

F. Provide pulse start lamps for pulse start fixture types.

G. Metal Halide lamps for outdoor applications shall be clear.

2.09 EMERGENCY TRANSFER AND BATTERY PACKS

A. Emergency lighting shall be provided with an emergency ballast. Ballast shall delay AC ballast operation for five seconds to prevent false tripping of AC ballast end-of-life shutdown circuits. Emergency ballast shall consist of a high-temperature, maintenance-free nickel-cadmium battery, charger and electronic circuitry contained in one galvanized steel case.

B. A solid state charging indicator light to monitor the charger and battery, a single-pole test switch, and installation hardware shall be provided, and shall be completely assembled in the luminaire.

C. Where emergency fixtures are installed in locations inaccessible from a 15-foot ladder, the test switch shall be installed remotely in location as determined by the Architect or as indicated on drawings.

D. The emergency ballast shall be capable of providing the lumen output as indicated below. Acceptable manufacturer: Bodine, Iota Engineering, Side-Lite, DualLite. (Bodine model numbers are listed for quality standards.)
   1. 450 total lumens for straight lamps : Bodine B100 (Code Compliant minimum)
   2. 600 total lumens for straight lamps : Bodine B90
   3. 700 total lumens for straight lamps : Bodine B60
   4. 1350 total Lumens for straight lamps: Bodine B50 (High lumen output)
   5. 3500 total lumens for straight lamps or 4-pin compact fluorescent: Bodine B30 (Full lumen output)
   6. 950 Lumens for 2 pin compact fluorescent: Bodine B426 (High lumen output)
   7. 1050 Lumens for use with dimming ballasts: Bodine B84C (High lumen output)

E. The emergency ballast shall be capable of providing the lumen output as indicated below. Acceptable manufacturer: Bodine, Iota Engineering, Side-Lite, DualLite. (Bodine model numbers are listed for quality standards.)
   1. Provide 100% full light output (3500 total lumens) for straight lamps in designated operating room fixtures. Provide a single wall-mounted test switch, Bodine KTS-PL, which will simultaneously test multiple battery units.

F. Where Emergency lighting is connected to a generator, but where time delay for lamp restart is not acceptable, provide short duration battery packs for indicated fixtures which

will provide continuous light output until generator start-up and transfer is completed. Battery pack shall be capable of providing the lumen output as indicated below.

1. 3200 lumens for a single straight or long compact fluorescent lamp: Bodine GEN1
2. 7900 total lumens for multiple straight or long compact fluorescent lamps: Bodine GEN3.

G. Where Emergency lighting is connected to a generator, but must also be controlled locally, provide a transfer device for each fixture, which will bypass the local control upon loss of normal power source. Device shall be mounted within the associated fixture and shall be warranted by the manufacturer for five years. Unit shall be UL listed as a transfer device, equivalent to Bodine GTD or approved equal.

2.10 ATTIC STOCK

A. Provide one case of each lamp type utilized in the project and turn over to owner at project completion.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Scheduling of fixture installation shall be coordinated with other trades such that the fixtures will be protected from construction and dirt/water/debris damage. Fixtures, which are damaged, shall be replaced at no cost to the owner.

B. Fixtures shall be securely mounted as required by NEC and manufacturer recommendation.

C. Coordinate with ceiling system contractor for the installation of ceiling support wires at two opposing corners of recessed troffer fixtures.

D. Support fixtures in seismic zones as detailed on drawings.

E. Fixtures shall be located and installed as shown on architectural reflected ceiling plans. Coordinate with other trades to allow fixture locations to clear diffusers, ductwork and piping.

F. Coordinate final locations and mounting heights of fixtures within mechanical and electrical rooms with units, duct, conduit, and cable tray routings for optimal performance of specified fixtures. Maintain access for servicing of luminaire components.

G. Determine type of ceiling to be installed in each space from architectural drawings and schedules and furnish fixtures suitable for the exact ceiling type.

H. Receive, store, uncrate, install and lamp fixtures shown in schedule on drawings or indicated to be furnished by others.

I. Recessed fixtures in dropped ceiling areas shall be connected using flexible conduit. Conduit shall be connected to fixture and outlet box. Each piece shall have a separate insulated green grounding conductor not smaller than No. 14 for grounding continuity

between fixture and conduit system. Grounding conductor shall be mechanically connected in a permanent and effective manner to fixture and conduit system and be electrically continuous. No conduit shall enter a recessed fixture directly as this method prevents removal of fixture without disturbing balance of circuit.

J. Recessed fixtures installed in exposed or concealed tee bar ceilings may used ceiling grid to support fixtures. Fixtures shall be securely fastened to ceiling framework using approved clips per NEC.

K. Recessed and surface fixtures in or on concealed Z-spline ceilings shall be supported from the building structure.

L. Recessed and surface fixtures in or on plastered or drywall ceilings shall be supported from support channel spanning across main support channels and shall not depend on ceilings for support. Fixtures in plastered or dryvit ceilings shall have plaster frames.

M. Maintain integrity of enclosures on enclosed and gasketed fixtures. Minimize number of enclosure penetrations and make such penetrations water and dust tight with appropriate gasketing and fittings.

N. Where fixtures are served from multiple circuits (i.e. normal and night/emergency operation or large loads which are dual level switched), each branch circuits shall be provided with a separate neutral conductor back to the associated panelboard.

O. Provide fire-rated enclosures around recessed luminaries, which are installed in fire, rated ceiling assemblies.

P. Coordinate length of continuous-run fluorescent fixtures with actual cove, wall, coffer, partition dimensions.

Q. Replace noisy ballasts as directed by the Architect.

R. Parabolic luminaries shall be installed with Mylar cover over louvers. Cover shall be UL listed for temporary lighting. Upon completion or work, remove Mylar cover with white gloves.

S. Upon final building cleaning, clean the lenses, baffles, louvers, reflector cones and bottoms of the trims of all lighting fixtures. Use soft, non-abrasive cloth and a cleaning solution as recommended by the fixture manufacturer. Luminaire components whose finishes are damages shall be replaces at no cost to the Owner.

3.02 AIMING AND ADJUSTMENTS

A. Adjustable fixtures shall be adjusted by the Contractor to illuminate intended area to the satisfaction of the Owner. Labor, equipment and other materials necessary to perform aiming shall be provided as needed.

B. Exterior adjustable fixtures shall be adjusted at night by the Contractor to illuminate intended area to the satisfaction of the Owner. Labor, equipment and other materials necessary to perform aiming shall be provided as needed.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide labor, materials, equipment and fixtures for exterior lighting, including, lamps, poles and pole bases, for:
   1. Parking lot and access roads
   2. Exterior signage
   3. Walkways and exterior building lights

C. Refer to details and arrangements shown on drawings.

D. Concrete bases will be installed under other Divisions. Coordinate proper size of bases, anchor bolts and conduit stub-ups.

E. Where seismic conditions exist, provide concrete bases as indicated in the detail on drawings.

F. Fixtures and poles shall be suitable for exterior use, shall be UL listed, and shall be a standard design for exterior application.

1.02 RELATED SECTIONS

A. Section 26 51 13: Interior Lighting Fixtures, Lamps, and Ballasts

B. Division 03: Concrete

C. Division 09: Painting

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are those shown in lighting fixture schedule on drawings.

B. For contactors: Square "D", General Electric, Allen-Bradley, Cutler Hammer.

C. For Photo Cells: Tork, model no. 2101.

2.02 MATERIALS

A. Luminaries, including all components, shall be designed to meet extreme temperature (low), moisture, and wind conditions in area of project.

B. Poles: Steel, round or square, designed for 100 MPH constant velocity wind load.
   1. Include base template, 4 anchor bolts, cadmium plated hardware and pole grounding lug, handhole, cast steel anchor base and bolt covers.
   2. Finish: Factory primed, supplier to furnish sufficient paint for adequate field painting of two coats. Application of paint shall be accomplished under Division 09.

C. Ballast shall be UL listed high power factor, designed for -20 F starting.

D. Diffusers shall be 100 percent virgin acrylic Plexiglas. Hardware and fasteners shall be corrosion resistant.

E. Pole wiring from base to ballast shall be No. 12 with fuse protection by a 30 A, 600 volt Tron waterproof fuseholder, Bussmann "Limitron" fuse, size rating 3 times load current.

F. Contactors: Mechanically held type, main contacts rated for 480 volts and ampacity required, 120 volt operating coil, designed for tungsten, fluorescent, metal halide, high pressure sodium or mercury lamp loads.
   1. Provide NEMA 1 enclosure
   2. Square D, Class 8903

G. Photo Cells shall be 120 volt, enclosed, weatherproof type for outdoor application.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install photo cells above roof with cells facing north.

END OF SECTION

PROJECT MANUAL

TENNESSEE STATE UNIVERSITY
FOOTBALL PRACTICE FACILITY

PREPARED FOR:
OWNER

TENNESSEE BOARD of REGENTS
OFFICE of FACILITIES DEVELOPMENT
NASHVILLE, TENNESSEE 37217-2833

SBC Project No. 166/001-03-2007

PREPARED BY:
DESIGNER

MOODY•NOLAN INC.
ARCHITECTS • ENGINEERS • PLANNERS
1625 BROADWAY, 4TH FLOOR

NASHVILLE, TENNESSEE 37203
615-386-9690 FAX 615-386-0528

CONSULTING ENGINEERS:

LITTLEJOHN ENGINEERING ASSOCIATES
CIVIL ENGINEERING

EMC STRUCTURAL ENGINEERS, P.C.
STRUCTURAL ENGINEERING

SMITH SECKMAN REID, INC
MECHANICAL AND ELECTRICAL ENGINEERING

CONSTRUCTION DOCUMENTS
November 19, 2009

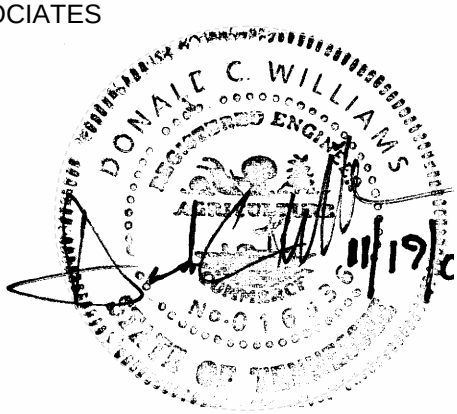
PROJECT DIRECTORY AND DESIGNERS' SEALS

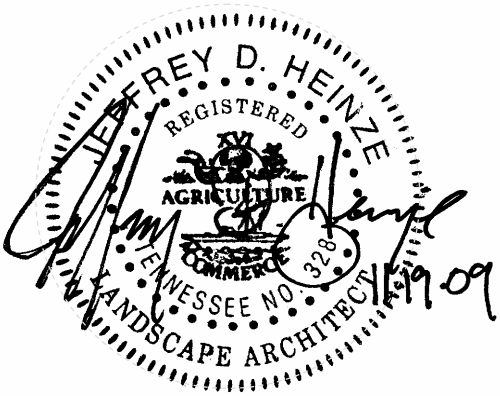
PROJECT:
TENNESSEE STATE UNIVERSITY
Football Practice Facility
3500 John A. Merritt Boulevard
Nashville, Tennessee 37209
SBC Project No. 166/001-03-2007

OWNER
TENNESSEE BOARD of REGENTS
Office of Facilities Development
Suite 664 (6th Floor SW) Genesco Park
1415 Murfreesboro Road
Nashville, Tennessee 37217-2833

ARCHITECT (DESIGNER)
MOODY•NOLAN, Inc
1625 Broadway, 4th Floor
Nashville, Tennessee 37203
Phone: (615) 386-9690
Fax: (615) 386-0528
Contact: Brian Tibbs
Email: btibbs@moodynolan.com

CIVIL ENGINEER / LANDSCAPE ARCHITECT
LITTLEJOHN ENGINEERING ASSOCIATES
1935 Twenty-First Avenue South
Nashville, Tennessee 37212
Phone: (615) 385-4144
Fax: (615) 385-4020
Contact: Travis Todd
Email: ttodd@leainc.com

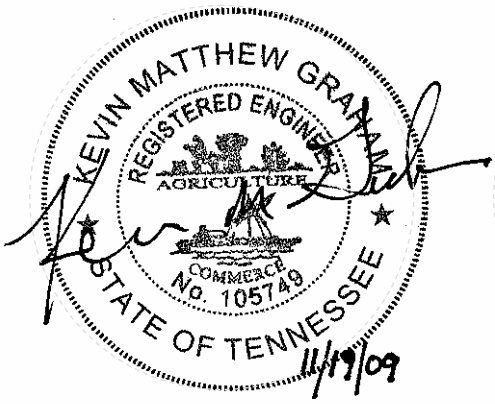


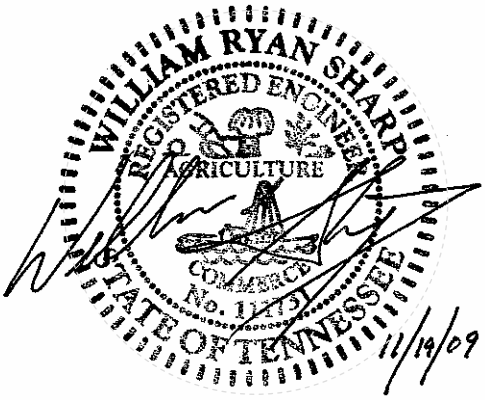


STRUCTURAL ENGINEER
EMC STRUCTURAL ENGINEERS
4525 Trousdale Drive
Nashville, Tennessee 37204
Phone: (615) 781-8199
Fax: (615) 781-4088
Contact: Dan Borsos
Email: danb@emcnashville.com

MECHANICAL / PLUMBING / ELECTRICAL ENGINEERS

SMITH SECKMAN REID, INC.
2995 Sidco Drive
Nashville, Tennessee 37204
Phone: (615) 383-1113
Fax: (615) 386-8469
Contact: Matt R. Clark
Email: mclark@ssr-inc.com





ADDITIONAL CONSULTANTS

SYNTHETIC ATHLETIC FIELD SURFACING

HFR DESIGN, INC.
7101 Executive Center Drive, Suite 300, P.O. Box 1974
Brentwood, Tennessee 37024-1974
Phone: (615) 370-8500
Fax: (615) 370-8530
Contact: Jim Gilliam
Email: JGilliam@hfrdesign.com

END OF SECTION

TABLE OF CONTENTS

			Pages
	Cover Sheet		
00 01 07	Project Directory and Designers' Seals		2
00 01 10	Table of Contents		5
00 01 15	Index of Drawings		2

DIVISION 0 – PROCUREMENT AND CONTRACTING REQUIREMENTS

BIDDING REQUIREMENTS

00 11 16	Invitation to Bid	[TBR]	1
00 21 13	Instructions to Bidders	[TBR]	3
00 22 20	Map to the Bid Opening Location	[TBR]	1
00 31 32	Geotechnical Information Available to Bidders	[TBR]	1
00 38 60	Disqualified Contractors and Subcontractors	[TBR]	1
00 41 13	Bid Form	[TBR]	2

CONTRACTING REQUIREMENTS

00 52 13	Agreement	[TBR]	4
00 54 33	ACH Credits Form	[TBR]	1
00 54 35	Substitute W-9 Form	[TBR]	1
00 61 13	Contract Bond	[TBR]	2
00 61 43	Three Year Roof Bond	[TBR]	2
00 72 13	General Conditions – AIA A201 (*TBR modified version*)	[TBR]	51
00 73 43	Prevailing Wage Rates	[TBR]	2
00 73 46	Wage Determination Form	[TBR]	3

DIVISION 1 - GENERAL REQUIREMENTS

01 11 00	Summary of Work		2
01 23 00	Alternates	[TBR]	1
01 26 00	Contract Modification Procedures	[TBR]	1
01 26 20	Weather Delays	[TBR]	2
01 26 25	Weather Delay Report	[TBR]	1
01 26 40	Forms for Amendment, Change Order or Directive	[TBR]	1
01 26 50	Forms for Itemization	[TBR]	3
01 29 73	Schedule of Values	[TBR]	1
01 29 76	Applications and Certificates for Payment	[TBR]	2
01 31 19	Project Meetings	[TBR]	1
01 31 90	Administrative Logs	[TBR]	1
01 32 15	Progress Schedules and Reports	[TBR]	1
01 33 23	Shop Drawings, Product Data and Samples		4
01 41 15	Basic Regulatory Requirements	[TBR]	1
01 43 25	Testing Laboratory Services	[TBR]	1
01 45 00	Quality Control		1
01 50 00	Temporary Facilities and Controls		8
01 60 00	Product Requirements		5
01 62 25	Product Options and Substitutions	[TBR]	1
01 62 32	Substitution Request Form	[TBR]	2

01 73 00	Execution Requirements		6
01 73 29	Cutting and Patching		3
01 74 00	Cleaning		4
01 77 70	Close-out Procedures	[TBR]	2
01 78 21	Close-out Submittals	[TBR]	1
01 78 25	Data Binder Receipt	[TBR]	1
01 78 36	Roofing System Warranty	[TBR]	3
01 78 88	Report of Subcontractors and Suppliers	[TBR]	1
01 79 21	Demonstration and Training	[TBR]	1
01 79 25	Demonstration and Training Verification	[TBR]	2

DIVISION 2 – EXISTING CONDITIONS

No sections required

DIVISION 3 - CONCRETE

03 30 00	Cast-In-Place Concrete	16

DIVISION 4 - MASONRY

No sections required

DIVISION 5 - METALS

Refer to Section 13 34 19 for Metal Building Systems Structural Framing and Components

05 50 00	Miscellaneous Metals	6

DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

06 10 00	Rough Carpentry	6
06 61 17	Solid Surface Countertops	4

DIVISION 7 - THERMAL & MOISTURE PROTECTION

07 11 13	Bituminous Dampproofing	3
07 21 00	Thermal insulation	4
07 26 00	Below-Grade Vapor Barriers	2
07 62 00	Flashing and Sheet Metal	5
07 84 00	Firestopping	10
07 92 00	Sealants	7

DIVISION 8 - DOORS & WINDOWS

08 11 13	Hollow Metal Doors and Frames	6
08 14 00	Wood Doors	5
08 33 23	Overhead Coiling Doors	5
08 41 13	Aluminum-Framed Entrances and Storefronts	8
08 71 00	Finish Hardware	13
08 81 00	Glass Glazing	6

DIVISION 9 - FINISHES

09 21 16	Gypsum Board Systems		13
09 30 00	Tile		8
09 51 13	Acoustical Panel Ceilings		4
09 65 00	Resilient Flooring		5
09 91 00	Painting		13

DIVISION 10 - SPECIALTIES

10 14 10	Interior Signage		5
10 14 16	Dedication Plaque		2
10 21 14	Plastic (Phenolic) Toilet Compartments		4
10 22 26	Folding Panel Partitions	*[Alternate #1]*	3
10 28 13	Toilet Accessories		4

DIVISION 11 - EQUIPMENT

11 52 13	Projection Screens	*[Alternate #1]*	2
11 66 26	Wall Padding		1

DIVISION 12 - FURNISHINGS

12 33 55	Plastic Laminate Faced Casework	*[Alternate #1]*	8

DIVISION 13 - SPECIAL CONSTRUCTION

13 34 19	Pre-Engineered Metal Building System		8

DIVISION 14 - CONVEYING EQUIPMENT

No Sections Required

DIVISION 21 - FIRE SUPPRESSION

21 05 00	Common Work Results For Fire Suppression		8
21 05 20	Fire Extinguishers, Fire Valves and Cabinets		2
21 05 53	Identification for Fire-Suppression Piping and Equipment		2
21 13 13	Fire Suppression Sprinkler Systems		6
(211313)	Fire Protection Calculations		7

DIVISION 22 - PLUMBING

22 05 00	Common Work Results for Plumbing		10
22 05 23	Valves for Plumbing Piping		2
22 05 29	Hangers for Plumbing Piping		3
22 05 53	Identification of Plumbing Piping and Equipment		2
22 07 00	Plumbing Insulation		3
22 11 16	Domestic Water Piping		5
22 11 19	Domestic Water Piping Specialties		2
22 13 16	Sanitary Waste and Vent Piping		2

22 13 19	Sanitary Waste Piping Specialties	3
22 33 36	Water Heater - Electric	2
22 40 00	Plumbing Fixtures	6

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING

23 05 00	Common Work Results for HVAC	11
23 05 13	Motors for HVAC	4
23 05 14	Variable Frequency Motor Drives	8
23 05 29	Pipe Hangers	3
23 05 48	Vibration Isolation	4
23 05 53	Identification for HVAC Equipment	2
23 05 93	Testing, Adjusting and Balancing for HVAC	8
23 07 00	HVAC Insulation	3
23 09 13	Instrumentation and Control Devices	7
23 09 23	Building Automation and Direct Digital Controls	25
23 11 23	Facility Natural Gas Piping	2
23 20 00	HVAC Piping	4
23 23 00	Refrigeration Piping System	2
23 31 13	Sheetmetal Ductwork	7
23 33 00	Air Duct Accessories	5
23 34 18	In-Line Tubular Centrifugal Fans	2
23 34 36	Propeller Fans	2
23 41 00	Particulate Air Filtration	2
23 73 50	Air Rotation Units	4
23 81 26	Split System A/C Units	2
23 82 39	Unit Heaters	2

DIVISION 26 - ELECTRICAL

26 05 00	Common Work Results for Electrical	8
26 05 19	Low Voltage Electrical Power Conductors	4
26 05 26	Grounding and Bonding for Electrical Systems	2
26 05 29	Hangers and Supports for Electrical Systems	2
26 05 33	Raceways and Conduit Systems	4
26 05 34	Pull and Junction Boxes	2
26 05 35	Outlet Boxes	3
26 05 43	Underground Ducts and Raceways for Electrical Systems	3
26 05 44	Prefabricated Concrete Manhole	6
26 05 53	Identification for Electrical Systems	2
26 05 73	Power System Analysis	7
26 22 13	Low Voltage Distribution Transformers	3
26 24 13	Switchboards	14
26 24 16	Panelboards	4
26 27 26	Wiring Devices	4
26 27 27	Wiring Device Plates	1
26 28 16	Enclosed Switches	2
26 29 13	Motor Starters	2
26 41 13	Lightning Protection Systems	4
26 43 13	Transient Voltage Surge Suppression	4
26 51 13	Interior Lighting Fixtures, Lamps and Ballasts	13
26 56 00	Exterior Lighting	2

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 05 00	Common Work Results for Electronic Safety and Security		5
28 30 00	Fire Detection and Alarm System		13

DIVISION 31 – EARTHWORK

31 11 00	Clearing & Grubbing		3
31 11 10	Demolition		2
31 23 00.13	Foundation Excavation and Backfilling	*[EMC section]*	6
31 23 13	Subgrade Preparation		5
31 23 23	Backfilling & Finish Grading		5
31 23 33	Trenching & Backfilling		5
31 31 16	Termite Control	*[MN section]*	3
31 37 00	Riprap		2
31 71 15	Proof Rolling		2

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 11 23	Base Course for Pavement		3
32 12 16	Asphaltic Concrete Pavement		3
32 13 13	Site Concrete Work		9
32 16 13	Concrete Curbs & Sidewalks		5
32 17 23	Pavement Marking		1
32 18 13	Synthetic Grass Surfacing	*[HFR section]*	10
Drawing	*T 1.0*	*Field Layout Graphics*	
Drawing	*T 1.1*	*Field Dimensions*	
32 92 19	Lawn & Grass Landscaping		4
32 93 00	Trees, Plants & Groundcover		15

DIVISION 33 – UTILITIES

33 11 10	Water Utility Distribution Piping		4
33 13 00	Disinfection of Water Distribution System		3
33 30 00	Sanitary Sewage Systems		5
33 40 00	Storm Drainage Systems		5

END OF TABLE OF CONTENTS

INDEX OF DRAWINGS

SHEET NO.:	DESCRIPTION	
GENERAL		
X 1.0	TITLE SHEET	
X 1.1	INDEX SHEET	
CIVIL & LANDSCAPING		
C 1.0	SITE SURVEY	
C 2.0	EROSION & SEDIMENT CONTROL PLAN	
C 2.1	EROSION & SEDIMENT CONTROL DETAILS	
C 3.0	DEMOLITION PLAN	
C 4.0	SITE LAYOUT PLAN	
C 5.0	GRADING & DRAINAGE PLAN	
C 6.0	SITE UTILITY PLAN	
C 6.1	PUBLIC WATER IMPROVEMENT PLAN	
C 7.0	SITE DETAILS	
C 7.1	SITE DETAILS	
L 1.0	LANDSCAPE PLAN	
SYNTHETIC ATHLETIC FIELD SURFACING		
T 1.0	FIELD LAYOUT GRAPHICS	*[in project manual]*
T 1.1	FIELD DIMENSIONS	*[in project manual]*
T 1.2	FIELD LAYOUT PLAN	
ARCHITECTURAL		
A 0.1	ARCHITECTURAL SITE PLAN	
A 1.0	FLOOR PLAN	
A 1.0A	FLOOR PLAN	***[Alternate No. 1]***
A 1.1	ROOF PLAN	
A 2.0	REFLECTED CEILING PLAN	
A 3.0	EXTERIOR ELEVATIONS	
A 4.0	BUILDING SECTION	
A 5.0	WALL SECTIONS	
A 5.1	WALL SECTIONS	
A 5.2	WALL SECTION DETAILS	
A 6.0	ENLARGED PLANS & INTERIOR ELEVATIONS	
A 7.0	SCHEDULES & DETAILS	
STRUCTURAL		
S 1.1	FOUNDATION PLAN	
S 1.2	ROOF / CEILING FRAMING PLAN	
S 2.1	SECTIONS & DETAILS	
S 2.2	SECTIONS & DETAILS	
S 3.1	GENERAL NOTES	
S 3.2	QUALITY ASSURANCE PLAN	

INDEX OF DRAWINGS

MECHANICAL

M 0.1	HVAC INDEX, LEGEND & SCHEDULES
M 1.0	HVAC PLAN
M 2.0	HVAC ENLARGED PLANS
M 4.1	HVAC DETAILS
M 7.1	HVAC CONTROLS
M 7.2	HVAC CONTROLS
M 7.3	HVAC CONTROLS

PLUMBING & FIRE PROTECTION

P 0.1	PLUMBING LEGENDS, SCHEDULES & NOTES
P 1.0	PLUMBING FLOOR PLAN
P 2.0	PLUMBING ENLARGED FLOOR PLANS
P 3.0	PLUMBING DETAILS
FP 0.1	FIRE PROTECTION LEGENDS, SCHEDULES & NOTES
FP 1.0	FIRE PROTECTION SITE PLAN
FP 2.0	FIRE PROTECTION FLOOR PLAN
FP 3.0	FIRE PROTECTION DETAILS

ELECTRICAL

E 0.1	ELECTRICAL LEGEND, INDEX & SCHEDULES
EL 1.0	LIGHTING FLOOR PLAN
EP 1.0	POWER FLOOR PLAN
ES 1.0	SYSTEMS FLOOR PLAN
E 4.1	ELECTRICAL DETAILS
E 4.2	ELECTRICAL DETAILS
E 5.1	ELECTRICAL DIAGRAMS

END OF INDEX

INVITATION TO BID

PROJECT:

Tennessee State University
Football Practice Facility
SBC Project No. 166/001-03-2007

DESIGNER:

Moody•Nolan, Inc.
1625 Broadway, 4th Floor
Nashville, Tennessee 37203
Tel. 615-386-9690 Fax 615-386-0528 Contact: Brian Tibbs

BRIEF PROJECT DESCRIPTION:

Construction of a wide span pre-engineered metal building practice facility with engineered field turf and an attached lean-to pre-engineered metal building administrative building; with site renovations and new site utilities.

Bids are invited for a General Contract for the Work of the above project.

Bids will be received by the State of Tennessee at

Tennessee Board of Regents (Central Office)
Office of Facilities Development
Suite 664 (6th Floor, southwest) Genesco Office Park
1415 Murfreesboro Road
Nashville, Tennessee 37217-2833

until

2:00 pm local time Wednesday January 13, 2010

at which time and place bids will be publicly opened. Bids sent by mail should be directed to the attention of

Rilla Froggett

Bidding documents may be examined at the Designer's office and at the following Plan Rooms:

F. W. Dodge Plan Room, Nashville, TN
Nashville Contractors' Association, Nashville, TN
Minority Business Development Center, Nashville, TN

Bidding Documents may be obtained from the Designer in accordance with the Instructions to Bidders upon the Designer's receipt of a certified or cashier's check payable to STATE OF TENNESSEE, payable in U.S. Dollars drawn on a U.S. bank, in the amount per set of **$ 150.00**

Bidders submitting bids equal to or greater than $25,000 in value are required to be licensed in accordance with state law. A statement of public contract crime status is required in the Bid form. A five percent (5%) Bid Security is required. Prevailing Wage law applies to any contract equal to or greater than $50,000 in value, or which has been determined to require Highway rates. Non-Discrimination policy applies to this project.

The Owner reserves the right to waive informalities and to reject bids.

INSTRUCTIONS TO BIDDERS

BIDDING DOCUMENTS

1.1 Bonafide prime Bidders and major subcontractors may obtain one Bid Pack, including Bidding Documents, Bid Envelope, and Bid Form, in accordance with provisions of the Invitation to Bid.

1.2 Individuals or firms securing Bid Packs become Bidders of Record, are automatically issued subsequent addenda, and will have deposit refunded upon returning complete Bidding Documents unmarked and in good condition within 15 days after the scheduled opening of bids. Bidders of Record who do not submit a bid are also required to return the unused Bid Envelope. Upon failure to meet these conditions, deposit shall be forfeited.

1.3 Bidders of Record may obtain additional copies of Bidding Documents at cost from Designer, but costs will not be refundable.

EXAMINATION

2.1 Bidders shall carefully examine site and documents to obtain first-hand knowledge of existing conditions and Work proposed. Copies of standards referenced in Project Manual are available for review through Designer's office.

2.2 Contractor will not be given extra payment for conditions which can be determined by examining site and documents.

QUESTIONS

3.1 Bidders shall submit questions about bidding documents to Designer in writing. Replies will be issued to Bidders of Record by addenda and will become part of Contract Documents. Designer and Owner will not make oral clarifications.

3.2 Questions must be received by Designer at least six calendar days before bid opening date.

3.3 No addenda will be issued less than three calendar days before bid opening date.

SUBSTITUTIONS

4.1 Substitutions before receipt of bids shall be as identified in Supplementary Conditions and Division 1 specifications. To request pre-bid approval of substitution, data required by Designer for evaluation must be received 10 calendar days before date set to receive bids. Acceptable substitutions will be identified in addenda.

4.2 Bidders submitting bids in reliance upon a substitution when the substitution has not been approved prior to bidding do so at their own risk.

LIQUIDATED DAMAGES and TIME

5.1 Conditions for liquidated damages are established in Supplementary Conditions. Time for completion and amount of liquidated damages are identified in Bid Form.

QUALIFICATIONS of CONTRACTORS

6.1 Bidders shall be familiar with the Contractors Licensing Act of 1976, as currently amended, codified in Tennessee Code Annotated Sections (TCA §) 62-6-101, et seq. A contract will not be awarded that conflicts with state licensing law.

6.2 In compliance with TCA § 50-9-114(a), potential bidders are advised that the Owner does not operate a certified drug-free workplace program providing for testing.

6.3 Bids submitted for this project shall not include a contractor or subcontractor that has been disqualified from participating in State construction projects under the supervision of the State Building Commission. As a matter of public record, the State Architect maintains a list of those that have been disqualified, and the Owner endeavors to include a current copy of that list in Bidding Requirements for its projects as Information Available to Bidders. Failure to include a current list shall not negate the effect of disqualification.

PRE-BID CONFERENCE

7.1 Pre-Bid Conference may be held approximately 10 days prior to bid opening date at time and place to be announced. Bidders of Record will be notified in writing whether or not a pre-bid conference will be held.

BID FORM

8.1 Make bids on an unaltered bid form furnished by the Designer in Bid Pack and duplicated in Project Manual. Submit one Bid Form. Failure to completely fill out Bid Form may cause bid to be rejected.

8.2 If a Bidder chooses not to bid an Alternate, Unit Price, or Base Bid in a multiple Base Bid project, write "no bid" in the space. To indicate availability of an Add Alternate at no additional charge, write "no charge" in the space. Additional stipulations or qualifications on Bid Form may cause bid to be rejected.

8.3 Bid Form shall be signed by person or persons legally authorized to bind Bidder to contract.

BID SECURITY

9.1 Bid Security is required in the amount of five percent (5%) of total amount bid, including alternates, made payable to State of Tennessee.

9.2 Bid Bonds shall be issued by Surety company licensed to do business in Tennessee by Tennessee Department of Commerce and Insurance, and shall have certified and current Power-of-Attorney for Attorney-in-Fact attached.

9.3 Checks shall be certified or cashier's, payable in U.S. Dollars drawn on a U.S. bank.

9.4 Owner may retain Bid Security of bidders to whom award is being considered until either: 1) Contract has been executed; 2) specified time has elapsed so that bid is not binding; or, 3) bid has been rejected. If Bidder refuses to enter into Contract or fails to furnish all required attachments properly executed, the amount of bid security shall be forfeited to Owner as liquidated damages, not as penalty.

BID SUBMITTAL

10.1 Submit Bid Form, with required attachments, in Owner's Bid Envelope furnished by Designer in Bid Pack. Blank spaces on face of Envelope shall be filled in by Bidder, except blank provided for Designer's approval.

10.2 If work is required for Plumbing, HVAC or Electrical, list subcontractor(s) that will perform that work. If there is no work in a category, write "None Required" in space. If Bidder will perform that work with Bidder's own forces, so indicate. If acceptance of alternate or combination of alternates changes subcontractor, indicate change on bid envelope.

10.3 Provide state contractor license number, expiration date, and applicable classifications for bidder and listed subcontractors.

10.4 Bidders are solely responsible for ensuring that bids are received by the time and at the place identified for receipt of bids. A bid sent by mail shall be enclosed in an envelope clearly marked "Bid Envelope Enclosed". Bids received late will be returned unopened.

WITHDRAWAL and MODIFICATION PRIOR to CLOSE of BIDDING

11.1 Bids, once submitted, may be withdrawn or modified before the scheduled opening time only upon receipt of request signed by a person legally authorized to bind bidder to contract. If bid is withdrawn, it may not be resubmitted. Modifications to bid may be made as "add" or "deduct" only. Oral, telephonic or telegraphic withdrawal or modification will not be considered. After time and date designated for receipt of bids, bid may not be modified during time period stipulated in Bid Form.

RECEIPT and OPENING of BIDS

12.1 Bids will be received and opened at time and place identified in Invitation to Bid.

POST-BID WITHDRAWAL of BID from CONSIDERATION DUE to MISTAKE

13.1 Request to withdraw bid due to mistake must be in writing to the Owner, delivered in person or postmarked certified or registered mail not later than twenty-four hours after the time fixed for receipt and opening of bids. Request shall acknowledge that bidder refuses to enter into contract based on bid and intends to submit original work papers, documents, and materials used in preparation of the bid in like manner within five working days following date of bid opening.

13.2 Bidder making such request will be removed from consideration for award of contract; and, a duly appointed review panel shall consider whether forfeiture of Bid Security should be waived.

CONSIDERATION of BIDS

14.1 To be considered, Bids shall be made in accordance with these Instructions to Bidders. Failure to comply with these bidding requirements may cause bid to be rejected.

14.2 It is Owner's intent to award contract, or multiple contracts in the case of multiple base bids, based upon lowest evaluated responsive bid submitted by responsible bidder for base bid plus alternates (if any) taken in order up to, but not to exceed the Bid Target. When alternates are included in bidding, Bid Target will be announced at bid opening prior to opening bids. Alternates may be accepted or rejected at Owner's discretion, provided that final combination of base bid and accepted alternates does not change low bidder as established by above method.

14.3 In the event of tie bids, preference will be given to in-state bidder over out-of-state bidder; and, if a tie still exists, successful bidder will be determined by chance.

14.4 In the case of a multiple Base Bid, Owner may award a combined contract for the Work of more than one Base Bid if the same bidder is the successful low bidder on each.

14.5 The Owner reserves right to: reject Unit Prices proposed in a bid without invalidating other portions of bid; reject a bid which does not provide all required Unit Prices; waive informalities; and, reject any or all bids.

POST BID INFORMATION

15.1 Each Bidder shall be prepared, if requested by Owner or Designer, to present evidence, within ten days of the request, of experience, qualifications, and financial ability to carry out the terms of the contract.

AGREEMENT FORMS and BONDS

16.1 Agreement form will be the Standard Form of Agreement Between Owner and Contractor included in this Project Manual. The following information and provisions will be filled in prior to the presentation of the Agreement form to Contractor by Owner: 1) Contracting Agency, Contractor, Project, and Designer will be identified on page one; 2) A full enumeration of the Contract Documents which make up the Agreement will be provided in Article 1; 3) Provisions for Contract Time and Liquidated Damages will be incorporated in Article 2; 4) The Contract Sum and the basis upon which it is determined, and Unit Prices proposed as a part of the successful bid which are accepted by the Owner, will be stated in Article 3; and, 5) The signature page will provide for a single signature by the Contractor, and will provide for the several signatures on behalf of the Owner as required by law and policy.

16.2 Successful Bidder shall complete and provide an Authorization Agreement for Automatic Deposits on the ACH Credits Form included in this Project Manual.

16.3 If the Contract Sum exceeds $100,000, the successful Bidder shall provide Contract Bond in the amount of one-hundred percent (100%) of the Contract Sum, and a Three Year Roof Bond, if and as stipulated in the Bid Form. Bonds shall be provided in accordance with paragraph 11.5 of the Conditions of the Contract and paragraph 17.2 below on the Owner's standard bond forms included in this Project Manual.

EXECUTION and AWARD of CONTRACT

17.1 Presentation of Agreement form by Owner to Successful Bidder for signature does not constitute award of Contract. Contract shall not be considered awarded until Bidder has received a fully executed Agreement.

17.2 If a Bidder is presented the written Agreement form for signing, then that Bidder shall deliver to the identified Owner's representative, within five calendar days after presentation, the required number of counterparts of the signed Agreement Form, Contract Bond, Roof Bond (if required), certificates of insurance, ACH Credits Form, and substitute W-9 federal tax form.

17.3 For the purpose of computing time, the five days referred to in paragraph 17.2 commence the day after receipt of the agreement form by Bidder. Should the fifth day fall on an State holiday, weekend, or other day of Owner's closing, Bidder shall provide required documents as directed no later than the next working day; however, regardless of circumstances or causes for Bidder exceeding delivery time, Owner shall be entitled to either require forfeiture of bid security or to add for each day the Bidder exceeds the five day period a corresponding extra day in which to return a fully executed contract, which return will be considered effectuated by mailing Agreement to the Contractor within the required time plus any extensions provided herein.

17.4 Owner will fill in date of Agreement on all forms when last signature is affixed. Last signature will be by Owner.

MINORITY PARTICIPATION

18.1 It is the express desire of the State Building Commission to include an emphasis on diversity in its contractual relationships with contractors for the construction, demolition, or renovation of State projects under jurisdiction of the Commission. The Commission acknowledges that firms who demonstrate and embrace diversity within their programs and policies are assisting the State in achieving its goals in building a more reflective marketplace of the community within this state. The State will require the successful bidder to report to the State the names and amounts of contracts entered into with minority-owned businesses on State projects in order for the State to collect data on such participation, as set forth in the Conditions of the Contract.

END of INSTRUCTIONS to BIDDERS

BID FORM

TO: **STATE OF TENNESSEE**
for the **PROJECT:** Tennessee State University
Football Practice Facility
SBC Project No. 166/001-03-2007

A. The Bidder hereby acknowledges, attests, certifies, warrants, and assures that:

1. Bidder has received, read, and understands the Bidding Documents, has visited the site and become familiar with local conditions under which work is to be performed, has correlated observations with requirements of Bidding Documents, and makes this bid in accordance therewith. Procurement Requirements documents numbered 00 30 00 through 00 39 99 provide Available Information that was prepared solely for Designer's use in design of this Work and have not been relied upon in the preparation of this bid. The use and interpretation of such information for any purposes is entirely the responsibility of the using party.

2. Contractors and subcontractors that have been disqualified from participating in State Building Commission projects have not been included in this bid, and will not be allowed to perform work under the contract that may result; and, Bidder shall not knowingly utilize the services of an illegal immigrant in the performance of this Contract and shall not knowingly utilize the services of any subcontractor or consultant who will utilize the services of an illegal immigrant in the performance of this Contract.

3. Failure to complete Bid Form, provide required attachments, or comply otherwise with the Instructions to Bidders, may be cause for rejection of bid; the person who signs this bid on behalf of the Bidder is required to be legally empowered to bind the Bidder to a Contract; and, the required Bid Security, in the amount of five percent (5%) of the total amount bid, is attached hereto.

4. The following statement is (check the one that is applicable)

☐ True
☐ False

The Bidder and/or any of the Bidder's employees, agents, independent contractors and/or proposed subcontractors have been convicted of, pled guilty to, or pled nolo contendere to any contract crime involving a public contract.

5. This Bidder has received the following addenda:

Addendum No _____ dated _____
Addendum No _____ dated _____
Addendum No _____ dated _____

B. This Bidder agrees to:

1. Honor this bid for a period of forty five (45) days following the date of the scheduled opening of bids.

2. Enter into and execute a contract, if presented on the basis of this bid, and furnish certificate(s) of insurance and other documents related to the contract as required, including, if the Contract Sum exceeds one-hundred-thousand dollars ($100,000), the Contract Bond and the Three Year Roof Bond, the latter in the amount of **$290,000.00**

3. Accomplish the Work in accordance with the Contract Documents.

4. Achieve Substantial Completion of the Work **180** calendar days from and including the date stipulated in the Notice to Proceed.

5. Accept the conditions for Liquidated Damages in the amount of **250** per calendar day.

BASE BID:

This Bidder agrees to complete the Work of the Base Bid for this project for the lump sum of (show amount in both words and figures):

_____and_____/100ths Dollars

$_____

ALTERNATES:

No. 1	Administration Offices Interior Finish-out	ADD	$_____
No. 2	Landscaping (non-essential as indicated)	ADD	$_____
No. 3	EMC hook up to campus system	ADD	$_____

Submitted by:

Authorized signature: _____ Date: _____

Name and title:
(Type or print) _____

On behalf of:
(Name of Bidder) _____

Bidder's address:
(Please give Street and Mailing address if different) _____

Bidder's Telephone Number: _____ Bidder's Fax Number: _____

Bidder's contact's email address: _____

Agreement

Between Owner and Contractor

where the Basis of Payment is a
STIPULATED SUM

Use only with the coordinated documents identified in the current
Designers' Manual
for projects of the State Building Commission of Tennessee and the Tennessee Board of Regents

AGREEMENT

made as of the day of in the year of

BETWEEN the Owner: **STATE OF TENNESSEE**
via the Contracting Agency: **Tennessee Board of Regents**

and the Contractor:

the Project:

the Designer:

The Owner and the Contractor agree as set forth below.

ARTICLE 1
THE WORK AND THE CONTRACT DOCUMENTS

1.1 The Contractor shall perform all the Work required by the Contract Documents for the Project identified on page one.

1.2 The Contract Documents are identified in the Conditions of the Contract (General, Supplementary, and other Conditions). These form the Contract and constitute the entire agreement between the Owner and the Contractor, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. An enumeration of the Contract Documents appears in paragraph 1.4.

1.3 Terms used in this Agreement which are defined in the Conditions of the Contract shall have the meanings designated in those Conditions.

1.4 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated as follows:

ARTICLE 2
TIME OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

2.1 The Work to be performed under this Contract shall be commenced on the date stipulated in the Notice to Proceed;
and, subject to authorized adjustments, Substantial Completion shall be achieved

2.2 Liquidated Damages, as set forth in paragraph 9.12 of the Supplementary Conditions, are

ARTICLE 3
CONTRACT SUM

3.1 The Owner shall pay the Contractor in current funds for the performance of the Work, subject to additions and deductions by Change Order as provided in the Contract Documents, the Contract Sum of

3.2 The Contract Sum is determined as follows:

3.3 The following Unit Prices will be used as specified:

This Agreement entered into as of the day and year first written above as witnessed:

BY CONTRACTOR:

Signature: _____

Name: _____

Title: _____

AND BY OWNER: STATE OF TENNESSEE
Tennessee Board of Regents

APPROVED: _____

APPROVED: _____

APPROVED: _____

BY: _____

END of AGREEMENT FORM for the Project titled:

ACH CREDITS FORM

Automated Clearing House Credits (not wire transfers)

Authorization Agreement for Automatic Deposits

Name: _____

Federal Identification Number or Social Security Number under which you are doing business with the State: _____

I/we hereby authorize the State of Tennessee, hereinafter called the STATE, to initiate credit entries to my/our

select type of account ☐ Checking or ☐ Savings

account indicated below and the depository named below, hereinafter called DEPOSITORY, to credit the same to such account. This authority to remain in full force and effect until the STATE has received notification from me (or either of us) of its termination in such time and in such manner as to afford the STATE and DEPOSITORY a reasonable opportunity to act on it.

Do you currently receive payments from the State through ACH? ☐ Yes ☐ No

If yes, do you intend for this account information to replace other existing account information currently used by the State? ☐ Yes ☐ No

If yes, please specify the account that should be changed:

ABA Number: _____ *Account Number:* _____

Is this authorization only for certain types of payments? ☐ Yes ☐ No

If yes, please indicate types:

_____

_____

Many banking institutions use different numbers for ACH.
Please call your bank for verification of ACH transit and account number.

Bank official contacted: _____ Phone number: _____

Depository / Bank:

Name: _____ Branch: _____

City: _____ State: _____

Transit/ABA No. _____ Account No.: _____

please print name(s) of authorized account signatory

Name(s) _____

Date _____ Signed: _____ Signed: _____

Please attach a deposit slip (or for checking accounts, a voided check).

Please indicate address to which you would like your remittance advisories routed when payments are processed:

For State use only: Contact Agency: _____

Contact Person: _____

Telephone No.: _____

SUBSTITUTE W-9 FORM

Request for Taxpayer identification number and certification

1. Please complete general information:

Name: _____ Phone Number: _____

Business Name *(if applicable)*: _____

Address: _____

City: _____ State: _____ Zip Code: _____

2. Circle the most appropriate category below: *(Please circle only one)*

1) Individual (not an actual business)

2) Joint account (two or more individuals)

3) Custodian account of a minor

4) **a)** Revocable savings trust (grantor is also trustee)

b) So-called trust account that is not a legal or valid trust under state law

5) Sole proprietorship (using a social security number for the taxpayer ID)

6) Sole proprietorship (using a federal employer identification number for taxpayer ID)

7) A valid trust, estate, or pension trust

8) Corporation

9) Association, club, religious, charitable, educational, or other non-profit organization (for entities that are exempt from federal tax, use category 13 below)

10) Partnership

11) A broker or registered nominee

12) Account with the Department of Agriculture in the name of a public entity that receives agricultural program payments

13) Government agencies and organizations that are tax-exempt under Internal revenue Service guidelines (i.e., IRC 501(c)3 entities)

3. Fill in your taxpayer identification number below: *(Please complete only one)*

1) If you circled number 1 - 5 above, fill in your Social Security Number.

____ ____ ____ - ____ ____ - ____ ____ ____ ____

2) If you circled number 6 - 13 above, fill in your Federal Employee Identification Number (EIN).

____ ____ - ____ ____ ____ ____ ____ ____ ____

4) Sign and date the form:

Certification - Under penalties of perjury, I certify that the number shown on this form is my correct taxpayer identification number. If I circled category 13 above, I also certify that my agency or organization is tax-exempt per Internal revenue Service guidelines and not subject to backup withholding.

Signature: _____ Date: _____

Title *(if applicable)*: _____

CONTRACT BOND

standard form for construction contracts under the State Building Commission of Tennessee

BOND NO. _____

Know all men by these presents: that we

(hereinafter called the "Principal") and

hereinafter called the "Surety") do hereby acknowledge ourselves indebted and securely bound and held unto

(hereinafter called the "Owner"), and in the penal sum of

good and lawful money of the United States of America, for the use and benefit of those entitled thereto, for the payment of which, well and truly to be made, we bind ourselves, our heirs, our administrators, executors, successors, and assigns, jointly and severally, firmly by these presents.

But the condition of the foregoing obligation or bond is this:

Whereas, the Owner has engaged the principal for the sum of

to complete the Work of the project titled:

as more fully appears in a written agreement or contract bearing the date of

a copy of which said agreement or contract is by reference hereby made a part hereof, as fully and to the same extent as if copied at length herein, and it is the desire of the Owner that the Principal shall assure all undertakings under said agreement or contract and shall assure and protect all laborers and furnishers of material on said Work both as provided by Tennessee Code Annotated Sections 4-15-102(f)(2) and 12-4-201 through 12-4-206, and any and all amendments thereto, and shall assure the prompt payment of claims as provided by Tennessee Code Annotated Sections 12-4-207 through 12-4-208, and any and all amendments thereto. The Principal shall also comply with provisions of Tennessee Code Annotated Sections 12-4-401 through 12-4-415, and any and all amendments thereto, pertaining to the payment of the prevailing wage rate.

Now, therefore, if the Principal shall fully and faithfully perform all undertakings and obligations under the contract hereinbefore referred to and shall fully indemnify and hold harmless the Owner from all costs and damage whatsoever which it may suffer by reason of any failure on the part of the Principal to do so, and shall fully reimburse and repay the Owner any and all outlay and expense which it may incur in making good any such default, and shall fully pay for all of the labor, material and work used by the Principal and any immediate or remote sub-contractor or furnisher of material under him in the performance of said contract, in lawful money of the United States, as the same shall become due, then this obligation or bond shall be null and void, otherwise to remain in full force and effect.

And for value received, it is hereby stipulated and agreed that no change, extension of time, alteration or addition to the terms of the contract or to the Work to be performed thereunder or to the specifications accompanying the same shall in any wise affect the obligation under this bond, and notice is hereby waived of any such change, extension of time, alteration or addition to the terms of the contract or to the Work or to the specifications.

In witness whereof the Principal has hereunto affixed its signature and Surety has hereunto caused to be affixed its corporate signature and seal, by its duly authorized officers, on this _____ day of _____, 20___.

Executed in _____ counterparts.

Witness:

_____	_____
(name of Principal)	*(name of Surety)*
_____	_____
(authorized signature)	*(signature of Attorney-in-fact)*
_____	_____
(name of signatory)	*(name of Attorney-in-fact)*
_____	_____
(title of signatory)	*(Tennessee license number of Agent or Attorney-in-fact)*
	_____
	(countersignature of resident Agent if not same as Attorney-in-fact)

Surety Company issuing bond shall be licensed to transact business in State of Tennessee by Tennessee Department of Commerce and Insurance. Bonds shall have certified and current Power-of-Attorney for the Surety's Attorney-in-Fact attached. Attorney-in-fact who executes bond on behalf of Surety shall be licensed by and a resident of State of Tennessee, and shall affix license number to bond; or, countersignature by a licensed agent who is a resident of State of Tennessee, and the agent's license number, shall be affixed to the bond in addition to the signature of the Attorney-in-Fact.

Compliance with State of Tennessee Laws Requiring Payment of

Prevailing Wage Rates

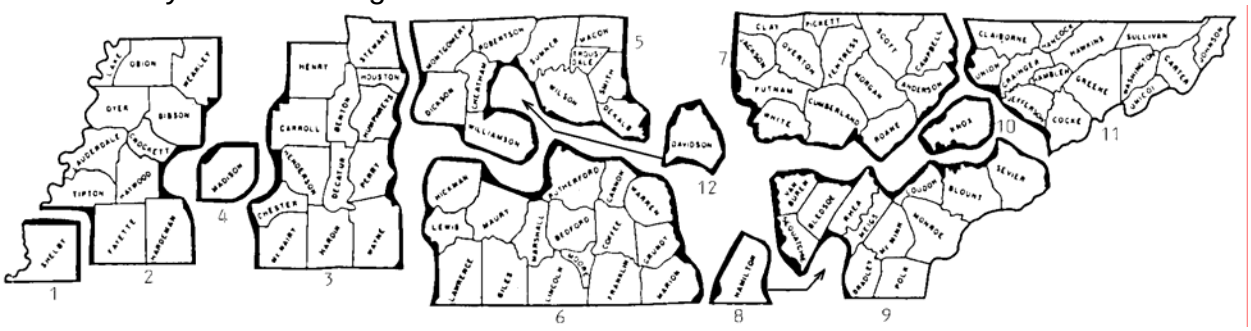
A. Refer also to the other Conditions of the Contract, particularly:

1. For projects using OFD General Conditions for General Work, which is a modified version of AIA document A201, subparagraph 3.4.6.

2. For projects using OFD General Conditions for Minor Work, subparagraph 3.4.4.

B. Establishment of Rates:

1. TCA § 12-4-401, et seq, mandates minimum rates to be paid to the workers on State construction projects. Pursuant to that law, a Wage Rate Determination is included in the bidding and contract documents, following this document, and includes a form identifying a Decision Number followed by a list or lists of rates for building construction and/or highway construction, as determined applicable by the Department of Labor and Workforce Development (DoL&WD) and indicated in the Determination. Highway rates are state-wide, but Building Rates are issued for 12 regions. The map below is believed to accurately reflect the regions.



2. Depending on the Work, multiple rates may apply, and multiple lists may be required. Anyone using a rate list should beware of the remote possibility of a clerical error in the issuance.

C. To determine the rates required to be paid laborers and mechanics on the project:

1. Refer to the Wage Rate Determination(s) to see whether Building Rates, Highway Rates, or both apply.

2. For Work that requires Building Rates in more than one county, if the counties are in more than one of the 12 Building Rate Regions, there is normally a separate Determination for each Region, and a separate list of rates for each region. Each regional list of building rates normally has the Region identified at the bottom of the page, and applies to Work performed in that Region. Occasionally, a table of rates for all 12 regions is included.

3. Highway Wage Rates, when applicable, apply state-wide in all locations.

4. Further details about Prevailing Wage regions, regulations, and descriptions of the craft classifications can be obtained from the DoL&WD Division of Labor Standards, including but not limited to their website: http://www.state.tn.us/labor-wfd/prevail.html

5. If federal wage rates are also required, the required documents pertaining thereto are to be included here following the list(s) of State rates. In such cases, and when workers are employed for work listed in both rate schedules, the workers are to be paid the higher of the scheduled rates.

D. To report the rates paid laborers and mechanics on the project:

1. Refer to the Wage Rate Determination(s) for identification and address of Inspector.
2. If there is more than one Determination, prepare a separate report for the portion of Work each covers.
3. Include Decision Number on report.
4. Send report to the Inspector listed in the box headed “Report to”.

E. Claims by the State for non-compliance.

1. If the DoL&WD suspects that a worker is not being paid in accordance with the Prevailing Wage Rates, the DoL&WD may make an estimate of the possible wage liability and bring that to the attention of the Owner.

2. The Owner may treat the DoL&WD estimate of wage liability as a claim.

END of document.

Combined Request and Decision form for

Wage Determination

Request made by	
Name of person	Trish Whitlock
Title	Project Manager
Department, Agency, or Bureau	Tennessee Board of Regents Office of Facilities Development
Address and phone	Suite 664 1415 Murfreesboro Road Nashville, Tennessee 37217-2833 Fax: (615) 366-3992

Date of request	Date of Advertisement	Supercedes Decision
11/12/2009	12/02/2009	

If Work is in multiple building rate regions, a separate request is required for each region; and, if in multiple counties within a region, all counties must be listed.

The Project		
City	**State**	**County**
Nashville	TN	Davidson

Project Identification

SBC Project No. 166/001-03-2007
Football Practice Facility
Tennessee State University
Nashville, TN

Brief Project Description

Construct a 225' x 270' pre-engineered building for indoor practice and football meeting/operations facilities with a 225' x 30' build out.

Decision rendered by
State of Tennessee Dept. of Labor and Workforce Development Labor Standards Division 220 French Landing Drive Nashville, Tennessee 37243-1002

Wage Determination

Decision Number **T-32901**

Building Rates	[X]	Apply
	[ ]	Do not apply
Highway Rates	[ ]	Apply
	[X]	Do not apply

Report to

INSPECTOR THOMAS HAMLETT
DEPT. OF LABOR & WORKFORCE DEV.
DIVISION OF LABOR STANDARDS
220 FRENCH LANDING DRIVE
NASHVILLE, TN. 37243-1002

Date assigned	Assigned by
11/12/2009	Michael Dattilo

The project identification and brief project description given herein shall not act to define, expand, or limit the Work required by the Contract Documents. Such information provided herein is intended only as information to the Department of Labor and Workforce Development. No other use or interpretation is intended.

CLASSIFICATION	CLASSIFICATION	REGIONS	1	2	3	4	5	6	7	8	9	10	11	12
Boilermaker	Constructor de Calderas	01	21.22	16.82	18.13	15.53	16.27	15.15	20.23	20.86	18.98	19.25	13.57	16.05
Bricklayer	Ladrillero	02	18.78	23.16	18.57	15.44	25.03	24.85	18.49	23.69	20.27	17.39	11.97	20.00
Carpenter	Carpintero	03	20.31	15.76	19.51	18.86	16.65	18.29	21.95	20.52	18.12	17.80	14.14	17.21
Cement Finisher, Plaster	Terminador de Cemento	04	17.25	13.99	15.15	14.17	13.32	14.81	21.68	18.09	16.36	17.58	14.04	16.45
Class "A" Operator	Operador Clase "A"	05	20.42	17.87	19.99	16.39	16.45	18.65	22.64	17.24	14.35	18.78	14.18	16.60
Class "B" Operator	Operador Clase "B"	06	13.50	12.53	14.55	12.62	10.87	11.84	13.99	14.43	11.60	11.23	8.52	11.73
Class "C" Operator	Operador Clase "C"	07	15.88	18.50	13.30	12.82	12.52	12.44	15.06	17.08	10.30	15.77	10.97	12.26
Electrician	Electricista	08	22.06	22.03	18.20	18.83	21.01	22.45	23.24	25.93	20.35	21.56	17.56	21.81
Low Voltage Electrician <70 Volts	Electricista De Bajo Voltaje <70 Volts	09	20.30	16.64	16.64	16.64	15.50	17.28	16.64	16.64	16.64	16.31	16.64	17.23
Elevator Constructor	Constructor de Elevadores	10	20.32	15.96	17.71	14.72	24.81	24.65	18.36	20.39	18.52	19.14	19.04	25.18
Glazier	Vidriero/Rebanadador	11	20.12	18.17	14.65	12.19	18.22	17.45	16.90	16.23	15.89	16.07	16.09	17.39
Insulation Worker for Mechanical Trades / Asbestos Worker	Trabajador de Insulacion para Entramador de Mecanico/ Trabajadora De Asbesto	12	21.87	22.99	23.01	19.31	17.49	18.44	20.25	20.99	19.92	14.02	13.40	18.01
Iron Worker: Structural, Reinforcing, Ornamental	Herrero	13	21.03	17.09	14.14	19.30	16.26	21.13	21.42	21.20	16.93	15.24	13.80	19.46
Laborer Class A	Obrero Clase A	14	13.12	12.29	11.97	11.91	16.83	12.27	13.38	12.46	11.67	13.94	10.28	12.41
Laborer Class B	Obrero Clase B	15	12.90	9.79	15.80	11.24	11.76	11.78	14.49	10.86	11.15	11.43	9.22	12.50
Millwright	Tornero	16	18.14	14.05	16.71	14.28	15.62	20.76	18.94	19.16	15.89	15.19	23.60	19.80
Painter/Plasterer	Pintor/Yesero	17	17.53	17.85	20.22	12.32	14.15	12.87	19.53	17.07	12.86	15.32	14.26	15.09
Pipefitter/Plumber	Instalador de Tuberia/Plomero	18	25.22	22.55	22.47	21.58	20.25	26.52	24.48	20.99	15.06	17.50	15.70	25.97
Roofer	Tejero/Instalador de Techos	19	19.59	13.37	15.45	11.54	13.54	13.13	17.26	20.60	14.57	16.83	14.02	20.43
Sheet-Metal Worker	Hojalatero	20	26.50	22.29	23.81	15.57	19.98	22.68	23.80	19.61	15.76	19.03	17.86	21.97
Truck Driver (3 or more axles)	Camionero (3 o más ejes)	21	15.13	10.62	11.96	10.26	12.85	12.44	17.48	17.71	9.70	10.83	11.15	16.21
Truck Driver (2 axles, over 1 ton)	Camionero (2 ejes,más de 1 tonelada)	22	16.00	8.48	9.41	10.80	13.55	9.40	11.01	14.19	10.01	12.05	11.42	17.93
Truck Driver (2 axles, 1 ton & less)	Camionero (2 ejes,menos de 1 tonelada)	23	15.37	9.26	10.27	10.93	10.60	8.33	17.41	13.91	9.41	10.61	13.73	10.63

APPRENTICESHIP REGULATIONS

Under T.C.A., §12-4-415, the Prevailing Wage Commission has promulgated Rule 0800-3-2-.01(1) which provides that: "Apprentices shall mean those persons registered individually under a bona fide apprenticeship program registered with the Bureau of Apprenticeship and Training in the United States Department of Labor. The state agency contracting officer shall require the contractor or sub-contractor using the apprentice to submit evidence of his indenture and/or apprenticeship registration when the apprentice's name first appears on a submitting payroll."

AUTHORITY: T.C.A. §12-4-415. **Administrative History:** Original Rule filed June 4, 1976. Effective: July 14, 1976.

The Tennessee Department of Labor and Workforce Development is an equal opportunity employer. Auxiliary aids and services are available upon request to individuals with disabilities.
TTY: 615-532-2870; 1-800-848-0299; TTY/TDD 711.

Tennessee Department of Labor and Workforce Development, Authorization No. 337462. 600 copies. 02/07 This document has been promulgated at a cost of $.02 per copy.

REGION 1
Shelby

REGION 2
Crockett
Dyer
Fayette
Gibson
Hardeman
Haywood
Lake
Lauderdale
Obion
Tipton
Weakley

REGION 3
Benton
Carroll
Chester
Decatur
Hardin
Henderson
Henry
Houston
Humphreys
McNairy
Perry
Stewart
Wayne

REGION 4
Madison

REGION 5
Cheatham
Dekalb
Dickson
Macon
Montgomery
Robertson
Smith
Sumner
Trousdale
Williamson
Wilson

REGION 6
Bedford
Cannon
Coffee
Franklin
Giles
Grundy
Hickman
Lawrence
Lewis
Lincoln
Marion
Marshall
Maury
Moore
Rutherford
Warren

REGION 7
Anderson
Campbell
Clay
Cumberland
Fentress
Jackson
Morgan
Overton
Pickett
Putnam
Roane
Scott
White

REGION 8
Hamilton

REGION 9
Bledsoe
Blount
Bradley
Loudon
McMinn
Meigs
Monroe
Polk
Rhea
Sequatchie
Sevier
Van Buren

REGION 10
Knox

REGION 11
Carter
Claiborne
Cocke
Grainger
Greene
Hamblen
Hancock
Hawkins
Jefferson
Johnson
Sullivan
Unicoi
Union
Washington

REGION 12
Davidson

SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.01 GENERAL PROJECT DESCRIPTION

A. Project Description: This project consists of the construction of a wide span pre-engineered metal building (indoor practice facility) with engineered field turf and an attached lean-to pre-engineered metal building (administrative wing), totaling 63,260 GSF; with site renovations and new site utilities, for Tennessee State University. The project is located at 3500 John Merritt Boulevard, Nashville, TN 37209, as indicated on Project Documents prepared by Moody Nolan, Inc. 1625 Broadway, Suite 400, Nashville, TN 37203.

B. Project is to be constructed under a single prime contract.

C. A subsurface geotechnical investigation has been performed per Section 00 31 32. All other testing and inspections shall be performed by testing firms hired by and paid for by the Contractor, as approved by the Architect. See the various specification sections for testing requirements.

1.02 DESCRIPTION OF WORK

A. The following is a brief description of work under Contract for this project. Refer to the drawing package and project manual for total scope of work:

1. Selected site demolition and removal / disposal of all materials including excavated materials determined to be unsuitable for backfill, fill or grading by the Geotechnical Engineer.
2. Site clearing, grading, landscaping and paving; and erosion control.
3. Subsurface utility installations and utility services along with complete storm drainage and sanitary sewer systems.
4. Complete metal building system for combined long-span and lean-to engineered structure along with all related structural components.
5. Complete finish out of long span practice facility (55,320 GSF) including field turf, MPE systems, all service utilities and related site work.
6. Complete the building shell portion of the attached lean-to metal building system (7,940 GSF), with related structural components and site work. The interior finish-out portion of this wing (2,725 GSF) will only occur in the lobby, toilet, training and service rooms. The finish out of the remaining areas will be the scope of work in alternate #1 (see Section 01 23 00).
7. Coordination of new work with existing campus systems.

1.03 PROJECT SCHEDULE

A. Prepare a detailed construction procedure and schedule and submit it to the Architect for approval. Such procedure and schedule must be approved in writing by the Architect prior to the start of construction work. See General Conditions,

Article 14 and Section 01 32 15.

B. Completion of the work within the time frame allotted is critical to the project and the schedule will be strictly adhered to. Contractor shall be responsible for the expediting of the fabrication and delivery of materials and equipment and shall coordinate delivery of same with the approved construction schedule to allow for completion within the time period specified in the Form of Proposal.

1. It is recognized that the work can be unavoidably affected or influenced by governing regulations, natural phenomena including weather conditions and other forces outside the Contract Documents. However, every effort must be made to keep the project on schedule due to the firm deadline established by the Owner for this particular phase of the work.

1.04 MISCELLANEOUS PROVISIONS

A. Performance Requirements for Completed Work: Provide the final and completed project complete and ready for use in every respect by the completion date specified herein.

1. Contract Documents indicate the intended occupancy and utilization of the building and its individual systems and facilities. Compliance with all applicable governing regulations, codes and standards is intended and required for the work and for the Owner's occupancy and utilization.

2. In addition to the requirement that every element of the work comply with applicable requirements of the Contract Documents, it is also required that the work as a whole comply with all applicable industry standards and governing codes and regulations.

3. All Work, including means and methods, shall comply with the regulations and procedures established by the Tennessee Board of Regents (Owner).

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 - GENERAL

1.01 SECTION INCLUDES identification of each Alternate by number, and describes the basic changes to be incorporated into the Work if a particular alternate is made a part of the work by specific provisions in the Agreement between the Owner and the Contractor.

1.02 RELATED SECTIONS are referenced in the definition of each Alternate.

1.03 COORDINATION of related work and modifications to surrounding work as required to properly integrate each Alternate, and to provide the complete construction required by the Contract Documents, is the responsibility of the Contractor.

1.04 DESCRIPTION OF ALTERNATES:

Alternate No. 1 [Administration Offices]

Base Bid	Provide scope of work as indicated on Sheet A 1.0, including unfinished shell for the administration building.
Alternate	Provide complete interior finish-out of administration building, including MPE, as indicated on Sheet A 1.0 A.

Alternate No. 2 [Landscaping]

Base Bid	Provide landscaping as indicated on Sheet L.1.0.
Alternate	Provide non-essential trees and shrubbery as highlighted on landscape plan.

Alternate No. 3 [Emergency Management Control (EMC) Hook-up]

Base Bid	No connection to existing system.
Alternate	Provide connection to campus-wide system.

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SUPPORTING DOCUMENTATION for PROPOSALS or CLAIMS

A. Propose related changes to Work, Contract Sum, and Contract Time, in writing together. Propose unrelated changes separately. Attach and reference pertinent documents related to the change.

B. For a change in the Work, specifically describe proposed change, or briefly describe the proposed change with specific reference to a completely descriptive attachment, such as a Request for Proposal from the Designer.

C. For a change in Contract Sum, state briefly the reason for change, state the amount, and provide itemization of values on forms shown in Section 01 26 50, or similar forms providing the same information:

1. **Itemization Summary:** listing the itemizations of work by subcontractors and the Contractor that together apply to an entire related change in work.
2. **Itemization of Class 1 Time-Related Expenses:** if applicable, deriving an average cost per day.
3. **Itemization of Work:** detailing the quantities, units, costs, and extensions for materials, equipment, and labor, subtotaled, plus overhead, and profit related to a specific proposed change in the Work.

D. For a change in Contract Time:

1. Fully describe the extent of and reasons for the change and effect of the change on the construction schedule, and attach a revised Progress Schedule. Take into account weekends, holidays, and the specified standard baseline for weather delays during the period of the requested extension.
2. For a change based on weather-related delay, provide and attach:
   a. applicable specified Weather Delay Reports, or, if none is specified, daily work logs that describe actual local weather conditions and their impact on progress.
   b. National Oceanic and Atmospheric Administration (NOAA) weather data, for corroboration.
   c. NOAA comparative data on normals, means, and extremes if such data or another weather baseline is not already provided in Contract Documents.

1.02 SIGNATURES for Change Order:

A. Form shall be similar in format and content to Section 01 26 40, and signed by authorized representatives of each of the entities required by Conditions of the Contract.

B. Normal procedure shall be that:

1. Designer prepares and submits supporting documents to Owner.
2. Owner produces and signs six (6) counterparts of form; transmits by fax, e-mail, or other means, informational copies to its Construction Representative, Designer, and Contractor; and forwards.
3. Owner's Construction Representative receives counterparts, and brings them to next Progress Meeting, unless urgency and opportunity make for a more timely execution.
4. Designer and Contractor both sign at Progress Meeting.

END OF SECTION

SECTION 01 26 40
FORM FOR AMENDMENT, CHANGE ORDER, OR DIRECTIVE

[ ] Amendment

[ ] Change Order

[ ] Construction Change Directive

Modification Number:

PROJECT:

Original Contract Date:
This Change initiated:

Project Number

The following changes in the Contract are hereby directed:

Item	Reference	Work	Contract-Sum	Contract-Time

The original Contract Sum	**$**
Net Change previously authorized	**$**
The Contract Sum prior to this Modification	**$**
This modification (*increases* / *does not change* / *decreases*) the Contract Sum	**$**
The new Contract sum, including this modification	**$**
This modification (*increases* / *does not change* / *decreases*) the Contract Time	
The new Contract Time, including this modification	
The last day of the Contract Time, including this modification	

CONTRACTOR	DESIGNER	OWNER
Signed	Signed	Signed
Name & Date	Name & Date	Name & Date
For	For	For

SECTION 01 26 50
FORMS FOR ITEMIZATION

Rounding off values is permitted on State contracts if rounding up for decreases and rounding down for increases. Embedded math functions without rounding are included in an Excel™ version of this form that can be downloaded from the website
http://www.tbr.state.tn.us/facilities/construction/forms.htm

Form for Itemization Summary

SBC Project Number:	Project Name:

Name of General Contractor:

Proposal Number:	Date Itemized:	Page of pages

Work by subs & sub-subs	Name of subcontractor	Costs & Allowances

Subtotal:	
5% additional OH&P allowed:	

Subtotal for general Contractor for Work by subcontractors:

Work by general Contractor:	

Subtotal (including subcontractors and the general Contractor)**:**

Bond Premium: % =

Total:

Form for Itemization of Class 1 Time-Related Expenses

SBC Project Number:	Project Name:
Work itemized below provided by:	
Proposal Number:	Date Itemized:	Page of pages

Description	Period Cost	Period (Year, Month, Week, Day)	Cost Per Day
Superintendent Salary			
Superintendent Vehicle			
General Use Vehicles			
_ _ _ _ _ _ _ _ _ _ _ _			
_ _ _ _ _ _ _ _ _ _ _ _			
_ _ _ _ _ _ _ _ _ _ _ _			
Field Office			
Field Office Equipment			
Computer			
Fax machine			
Copier			
Typewriter			
Calculator			
Field Office Utilities			
Electricity			
Natural Gas			
Water Service			
Drinking Water			
Telephone Service			
On-Site Storage			
Shed			
Trailer			
Safety Program			
Cleaning			
Site Toilet(s)			
		Subtotal of Costs:	
		10% for Overhead:	
		Subtotal with Overhead:	
		5% for Profit:	
		Total per day:	

Form for Itemization of Work

SBC Project Number:	Project Name:

Work itemized below provided by:

Proposal Number:	Date Itemized:	Page of pages

Description	Material				Equipment				Labor			
	Quantity	Unit	Cost	Extension	Quantity	Unit	Cost	Extension	Quantity	Unit	Cost	Extension

Materials Subtotal			Labor Subtotal:	
	% Sales Tax =			% Mark-up =
Materials Total:		**Equipment Total:**	**Labor Total:**	

Subtotal of Costs of Materials + Equipment + Labor = $

10% Overhead allowed on costs = $

Subtotal of Costs + Overhead = $

5% Profit allowed on Costs + Overhead = $

Total for this change = $

SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Phases are normally set forth in the Agreement and in the Summary of Work specification, normally from 01 10 00 to 01 10 19, but may differ in this Project Manual.

B. Applications for Payment and the final statement of accounting are normally specified in sections from 01 29 00 to 01 29 99, such as OFD standard Section 01 29 76, but may differ in this Project Manual.

C. Allowances are normally specified in sections from 01 21 00 to 01 21 99, such as OFD standard sections 01 21 13 and 01 21 15. Allowances associated with Unit Prices are normally in sections from 01 22 00 to 01 22 99, such as OFD standard sections 01 22 13 and 01 22 15. The arrangement of sections may differ in this Project Manual.

1.02 FORM and APPROVAL

A. The form for schedule of values shall be AIA Document G703 Continuation Sheet.

B. If objected to by Designer, revise and resubmit to Designer's satisfaction prior to submitting application for payment. If during construction the total completed for payment purposes exceeds or is anticipated to exceed allocations, revise and resubmit a schedule of values such that no values of completed work exceed their allocations.

1.03 ALLOCATION OF VALUES

A. If the Work is divided into defined portions ("Phases"), intended to have distinct commencement, duration, or completion requirements, divide the allocation to correspond to the Phases, then within each Phase, subdivide the allocations as specified in the following paragraphs.

B. Provide at least these three line items to account for General Requirements:

1. Mobilization, staging, and general start-up costs.
2. Construction administration and temporary facilities, prorated over the course of the project.
3. Maintenance of Record Documents, prorated over the course of the project.

C. If sitework is included, other than minor sitework incidental to a building or major structure, include sitework in single line item or group of line items. Within the group, categorize site utilities, roads and parking, and appurtenances according to general type and physical separation. If allowances are stipulated in the Work relating to sitework, provide a line item for each such allowance, including quantity allowances associated with Unit Prices.

D. For each involved building or major structure:

1. If allowances are stipulated in the Work, provide a line item in the Schedule of Values for each allowance, including quantity allowances associated with Unit Prices.
2. Categorize by major trades or units of work corresponding to the current Progress Schedule, and relate to the Divisions and Sections of the Specifications.
3. Further subdivide as desired, but maintain a distinct and identifiable correspondence to this allocation.

E. Account for Modifications by incorporating them into the appropriate allocations, or with a line item for each, until incorporating each into the appropriate allocations for the final statement of accounting.

END OF SECTION

SECTION 01 29 76
APPLICATIONS AND CERTIFICATES FOR PAYMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS FOR ALL APPLICATIONS

A. FORM:

1. Use AIA Document G702 Application and Certificate for Payment.

2. Use AIA Document G703 Continuation Sheet itemized with the line items and values of the Schedule of Values accepted by the Designer, and values and percentages for each line item.

B. Materials suitably stored on-site but not yet incorporated into the Work may be claimed for payment; and, materials suitably stored off-site may be claimed for payment if documented in accordance with 1.02.B.6 below.

C. Calculation of Retainage and amounts withheld:

1. Credit for completed work and stored materials, and deductions for incomplete work, comprise the "Total Completed and Stored to Date". The "Total Completed and Stored to Date" shall not include the value of Punch List items that remain incomplete after Substantial Completion.

2. Retainage is calculated as a percentage of "Total Completed and Stored to Date": 5% prior to Substantial Completion; 2% after Substantial Completion; then, none at final payment.

3. Other amounts withheld (i.e., potential liquidated damages or in response to subcontractor claims of non-payment) are deducted from the resulting Current Payment Due.

D. SUBMITTAL:

1. Submit draft of each application by fax or otherwise to Designer and to the Owner's Construction Representative three (3) days prior to actual submittal. Submit each application to the Designer at Progress Meeting, Substantial Completion inspection meeting, final inspection meeting, or after the final inspection meeting.

2. Submit six (6) counterparts bearing original seals and signatures, each with required attachments and accompanying submittals, in accordance with other applicable articles of this Section.

1.02 Provide the following ATTACHMENTS AND ACCOMPANYING SUBMITTALS with each counterpart of each application for PROGRESS PAYMENTS

A. Stamped or embossed counterpart of Consent of Surety, if application makes a reduction in retainage.

B. Copy of:

1. Continuation sheets.

2. Visitor Log for the period covered by application.

3. Weather Delay Report for all calendar months completed and not previously submitted.

4. Progress Schedule, updated and current, indicating progress through the period covered by application and scheduled progress through completion of Work.

5. Shop Drawing Log for entire project through the period covered by application, if required.

6. For materials stored off-site:

a. Statement identifying where materials are stored, and assuring that materials are tagged to identify them for use in the project.

b. Bill(s) of sale for materials claimed that list(s) all items.

c. Certificate of insurance covering materials claimed, recognizing Owner's right to make claims.

1.03 APPLICATION FOR PAYMENT UPON SUBSTANTIAL COMPLETION

A. At the Substantial Completion inspection, submit application for payment, including appropriate reduction in retainage, with the following attachments:

1. Continuation sheets described in 1.01.A.2.
2. Stamped or embossed counterpart of Consent of Surety to Reduction in Retainage, using AIA Document G707A or a similarly formed letter.
3. Copy of the Use & Occupancy Permit (some jurisdictions have a different name for this document).
4. Copy of a document identifying to whom Contractor delivered the Operating and Maintenance Data Binders.
5. Documents required for materials stored off-site, if applicable, in accordance with 1.02.B.6.
6. Weather Delay Report for all calendar months completed and not previously submitted.

B. In order to reduce retainage below the amount corresponding to Substantial Completion, complete the prerequisites to Final Payment specified in the Section on Close-Out Procedures and below.

1.04 APPLICATION FOR FINAL PAYMENT

A. When requesting final inspection, submit a final application for payment with the following attachments:

1. Final Continuation sheets described in 1.01.A.2.
2. Counterpart of Contractor's Affidavit of Payment of Debts and Claims, using AIA Document G706.
3. Stamped or embossed counterpart of Consent of Surety Company to Final Payment, using AIA Document G707 or a similarly formed letter. If Contractor has listed exceptions in the G706 form, Surety's consent shall acknowledge such exceptions.
4. Certificate of insurance for products and completed operations to the effect of that required by 9.10.2(2) and 11.1.2.1.c of the Conditions of the Contract.
5. Written statement assuring of continued insurability to the effect of that required by 9.10.2(3) of the Conditions of the Contract.
6. Final acounting of the Contract Sum which appropriately allocates the entire Contract Sum to the Divisions of the Specifications. This may follow the same format as the Schedule of Values.
7. Copy of the Roof Warranty or warranties, if and as required on form exhibited as Section 01 78 36.
8. Copy of the Report of Subcontractors and Suppliers, on form exhibited as Section 01 78 88 or equal.
9. Copy of a document identifying to whom Contractor delivered the Project Data Binders.
10. Weather Delay Report for all calendar months completed and not previously submitted.

B. After the Designer has certified that the Work and needed modifications to the Contract are complete, and if instructed to do so by the Designer, submit a revised application.

1.05 CERTIFICATION

A. Designer, if in disagreement with the amounts claimed in an application, may either return application to Contractor for revision and resubmittal, or revise application by hand to indicate corrections Designer considers appropriate.

B. Designer, finding an application complete and correct, will certify the application and forward one copy to Contractor to indicate the action taken.

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.01 SCHEDULING AND ATTENDANCE

A. The Designer, in cooperation with the Owner and the Contractor, will schedule and administer a Pre-Construction Conference, periodic Progress Meetings, and other specially called or required meetings.

B. Representatives of the Owner and the Designer will attend.

C. Representatives of the Contractor, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents. In the case of the Contractor, the representative shall be one who is authorized to sign change orders.

1.02 PRE-CONSTRUCTION CONFERENCE

A. A Pre-Construction Conference will be scheduled and conducted at the project site prior to the issuance of the Notice to Proceed.

B. The Pre-Construction Conference shall be attended by the Contractor's:

1. (Office) Job Manager
2. (Field) Job Superintendent
3. Major subcontractors' representatives
4. Major suppliers' representatives
5. Others, as desired.

C. The Pre-Construction Conference is intended to be an opportunity for the Contractor to review administrative, procedural, and temporary facilities requirements of the Contract Documents, and to ask questions concerning the Work.

1.03 PROGRESS MEETINGS

A. Progress Meetings will be scheduled and conducted at the project site prior to the Contractor's submittal of an application for payment, or when deemed advisable by the Designer.

B. Progress Meetings shall be attended by the Contractor's:

1. (Office) Job Manager
2. (Field) Job Superintendent
3. Subcontractors' representatives, as befits the agenda
4. Suppliers' representatives, as befits the agenda
5. Others, as appropriate.

C. Progress Meetings are intended to be a monthly opportunity for the Contractor to review and submit applications for payment, and attachments, and for a general review of the progress of the Work, aimed at identifying and mitigating impediments to timely completion.

D. Progress Meetings will be scheduled and conducted until final completion.

END OF SECTION

SECTION 01 31 90
ADMINISTRATIVE LOGS

PART 1 - GENERAL

1.01 SUBMITTALS LOG

A. If any shop drawings, product data, or sample submittals are required by the Contract Documents, maintain a submittals log to record the status of submittals made to the Designer.

1. Submit three (3) copies with each application for payment.

2. Clearly identify the Project.

3. Record activities with respect to shop drawings, product data, samples, and such other submittals which are required by the Contract Documents.

4. Indicate for each submittal made to date:

a. Title or name, and type of submittal.

b. Date submitted to the Designer.

c. Date returned by the Designer.

d. General nature of the Designer's response.

1.02 VISITOR LOG

A. Maintain visitor log in the field office (or with the Project Superintendent when no field office is required) to record visits by all persons not a part of the Contractor's forces, materials suppliers, or subcontractors' forces.

1. Submit three (3) copies with each application for payment.

2. Clearly identify the Project.

3. Indicate:

a. Visitor name and affiliation.

b. Date of visit.

c. Time of arrival and departure.

END OF SECTION

SECTION 01 32 15
PROGRESS SCHEDULES and REPORTS

PART 1 - GENERAL

1.01 INITIAL PROGRESS SCHEDULE

A. Submit within 21 days of award of the Contract, and not later than the date of submission of the first application for payment. Clearly identify the Project on the schedule.

B. Outline the orderly progress of the Work as planned from the Notice to Proceed through Substantial Completion on the contractually required date. Categorize the Work by Phase (if Phases are specified), major work area, and distinct trade or team, and divide into individual activities of one month or less duration each. Provide an identifiable relationship to the schedule of values. Identify projected monthly progress, points of 50% completion and Substantial Completion, and other major milestones.

C. A bar chart or critical path method is acceptable, or other method which is approved by the Designer.

1.02 SUBMITTALS SCHEDULE

A. Submit with the initial Progress Schedule. Clearly identify the Project, and format in a manner similar to the initial progress schedule, utilizing the same method, or make a part of the initial Progress Schedule.

B. Identify submittals to be made. Show date for submission and date by which Designer should respond, allowing sufficient time for review.

C. Designer may require revision of schedule if times allotted for review are insufficient.

1.03 UPDATED PROGRESS SCHEDULE

A. Submit three (3) copies with each application for payment.

B. Clearly identify the Project. Format in a manner similar to the initial progress schedule, utilizing the same method.

C. Indicate:

1. Work as initially scheduled.

2. Actual progress through the period covered by the current application for payment.

3. Planned progress through Substantial Completion, including extensions of time made by change order or construction change directive.

D. If actual progress falls behind projections, show how the backlog is to be made up so that the Work will be completed on time.

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Requirements of this Section are in addition to the requirements of the General Conditions.

B. This Section includes procedures for processing:

1. Shop drawings.
2. Product data.
3. Office samples.
4. Sample Warranties.
5. Mock-up samples.
6. Certificate of compliance.

C. Submittals as approved do not constitute a change order.

D. Submit all submittals under Contractor's Transmittal letter. Include the following:

1. Project by title.
2. Contractor's contract number.
3. Work and products by Specification Section and Article number.

E. Resubmittals: When Architect requires that a submittal be resubmitted, comply with requirements of this section.

1. Identify changes made since the previous submittal.

F. Notify Architect in writing at time of submittal of deviations from the requirements of the Contract Documents.

G. Make all submittals far enough in advance of scheduled dates for installation to provide sufficient time for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.

1. Architect's Review Time: In scheduling, allow at least 10 working days for Architect's review.
2. Delays caused by the tardiness of the Contractor in preparing and forwarding submittals will not be an acceptable basis for an extension of the Contract completion date or for consideration of alternate products which do not meet the specified requirements of this Project Manual.
3. Include submittal dates in Construction Schedule. See Section 01 32 15.

H. Where used in the Contract Documents, the words "or equal" or "or approved equal" shall be defined as "refer to the substitution requirements" specified in the Instructions to Bidders.

1.02 SHOP DRAWINGS

A. Reproduction of any portion of the Contract Documents for use as submittals for Shop Drawings is not acceptable.

B. Submit Shop Drawings in a clear and thorough manner.

1. Title each drawing with Project name.
2. Identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.

C. Identify the following:

1. Requirements of the individual section of Project Manual.
2. Field measurements.
3. Field construction criteria.
4. Relation to adjacent or critical features of the Work or products.
5. Conformance of submittal with requirements of Contract Documents.

D. Each sheet of Shop Drawings shall be stamped and signed by Contractor before submitting to Architect. Certify compliance with requirements of Contract Documents.

E. Review by the Architect shall not relieve Contractor from his responsibility in preparing and submitting proper Shop Drawings in accordance with his current obligations.

F. All submissions which, in the opinion of the Architect are incomplete, contain errors or have not been checked or only superficially checked, will be returned unchecked by the Architect for resubmission.

G. Fabrication of products or start of work before required Shop Drawings are approved by Architect and returned to Contractor shall be at Contractor's risk.

H. Required Printing: One set of reproducible prints and three sets of copies unless quantity is otherwise noted in an individual specification section.

1. This procedure is to be followed for each submission of a drawing or group of drawings until they are finally approved by the Architect.

I. Prepare coordination drawings and fully coordinate same with other trades and contiguous work.

1. Working drawings for coordination shall be submitted as directed by the Architect.

2. Architect reserves the right to require the submittal and/or approval of composite coordination drawings prior to the release of an individual Contractor's Shop Drawing and/or fabrication drawing.

1.03 PRODUCT DATA

A. Submit only pages which are pertinent.

1. Mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number.
2. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.

B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

C. Stamp and sign each set of manufacturer's product data before submitting to Architect to certify compliance with Contract Documents.

D. Number of Copies Required: Submit the number of copies which are required to be returned plus two copies which will be retained by the Architect, but not less than four in any case.

E. Upon approval, one copy of the approved data will be returned to the Contractor for his file. Contractor should submit additional sets above the minimum if he desires more than one copy with the Architect's comments.

1.04 OFFICE SAMPLES

A. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified, indicating colors, textures and patterns for Architect's selection.

B. Submit samples to illustrate functional characteristics of products, including parts and attachments.

C. Approved samples which may be used in the work are indicated in the specification section.

D. Label each sample with identification required for transmittal letter.

E. Number Required: As specified in individual specification section.

1.05 MOCK-UP SAMPLES

A. Where mock-up samples and similar samples are indicated in the individual specifications sections, comply with requirements for "Office Samples", and

process transmittal forms for mock-ups to provide a record of activity.

1.06 SAMPLE WARRANTIES

A. Submit for approval, sample copies of all specific warranties required in excess of one year duration.

B. Include sample warranties with related shop drawing submittal. Shop drawing review will not start without warranty submittal nor will shop drawings be released for fabrication or installation until sample warranty is approved.

1.07 CERTIFICATES OF COMPLIANCE

A. Where required by the specific specification sections, submit "Certificates of Compliance" certifying that all materials used in the work comply with all specified provisions thereof.

1. Submit in the form of a letter or company standard forms.
2. If test reports are submitted with "Certificates of Compliance". Test reports shall include data or dates of testing and results of testing.

1.08 TEST REPORTS

A. Test reports certified by an independent testing laboratory must be made available upon request by Architect.

END OF SECTION

SECTION 01 41 15
BASIC REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 CODES AND REGULATIONS

A. The Regulatory Requirements used for Tennessee Board of Regents projects are listed below as a convenience and may not be inclusive of all that apply. Others may also apply. Comply with all pertinent codes, standards, regulations and laws.

	Document	Source	Phone
1.	2006 International Building Code	International Code Council, Inc. 500 New Jersey Avenue NW, 6th Floor Washington, D.C. 20001	(202) 370-1800
2.	2006 International Mechanical Code Rules of the Tennessee Department of Commerce and Insurance Division of Fire Protection Chapter 0789-02-02 Codes and Standards		
3.	2006 International Fire Code		
4.	2008 National Electrical Code	National Fire Protection Association 1 Batterymarch Park Quincy, Massachusetts 02169	(800) 344-3555
5.	2006 Life Safety Code (NFPA No. 101-2006) (NFPA Standards as listed in NFPA 1, Chapter 2 – excluding NFPA 5000)		
6.	2007 Tennessee Elevator Safety Board Rules Chapter 0800-3-4 Elevators, Dumbwaiters, Escalators, and other Lifts	Tn. Dept. of Labor and Workforce Development Div. of Boiler & Elevator Inspection Elevator Safety Board 3rd Floor Andrew Johnson Tower 710 James Robertson Parkway Nashville, Tennessee 37243	(615) 741-2123
7.	2007 Board of Boiler Rules Chapter 0800-3-3 Boiler Inspections		
8.	ASHRAE standard 90.1-2004 Energy Standards for Bldgs except Low-Rise Residential Buildings	American Society of Heating, Refrigerating & Air Conditioning Engineers 1791 Tullie Circle NE Atlanta, Georgia 30329	(800) 527-4723
9.	ASHRAE standard 90.2-2004 Energy-Efficient Design of New Low-Rise Residential Buildings		
10.	ASHRAE standard 62.1-2007 Ventilation for Acceptable Indoor Air Quality		
11.	Tennessee Chapters 0780-2-1, Electrical Installations 0780-2-2, Codes & Standards 0780-2-3, Plan & Spec Review 0780-2-18, Equitable Restrooms	Tn. Dept. of Commerce and Insurance Div. of Fire Prevention, Codes Enforcement Sec. 3rd Floor Davy Crockett Tower 500 James Robertson Parkway Nashville, Tennessee 37243-1162	(615) 741-7190
12.	ADA Title II, 28 CFR parts 35 and/or 36 or, when applicable to specific Student Housing projects,	U.S. Department of Justice Civil Rights Division, Disability Rights Section-NYA 950 Pennsylvania, NW Washington, DC 20530	(800) 514-0301
	Uniform Federal Accessibility Standards, Fed-Std-795, April 1, 1988	Architectural and Transportation Barriers Compliance Board ATTN: OCE Suite 1000 @ 1331 F Street NW Washington, D.C. 20004	(202) 272-5434 (800) 872-2253 Tracy @ ext 30
13.	and, for Title III applications within Title II sites or facilities, 2002 North Carolina Accessibility Code w/ 2004 Amendments	N.C.Dept. of Insurance P.O.Box 26387 Raleigh, North Carolina 27611	(919) 733-3901

END OF SECTION

SECTION 01 43 25
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 CONTRACTOR'S RESPONSIBILITIES

A. Employ and pay for the services of an independent testing laboratory, approved by the Designer, to perform specified services and testing. Employment of laboratory does not relieve Contractor's obligations to perform the Work of the Contract.

B. Coordinate and pay for inspections and testing required by law, ordinance, rules, regulations, orders, or approvals of public authorities as required by the Contract Documents.

1. Furnish copies of Products Test reports as required.

2. Furnish incidental labor and facilities to facilitate inspections and tests and for storage and curing of test samples.

3. Notify the lab sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

4. Make arrangements with lab and pay for additional samples and tests required for Contractor's convenience.

1.02 TESTING LABORATORY

A. Qualifications:

1. Meet "Recommended Requirements for Independent Laboratory Qualification", published by the American Council of Independent Laboratories, and Basic requirements of ASTM E 329 "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".

2. Be authorized to operate in the State of Tennessee.

3. Submit copies to the Designer of the report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during the most recent tour of inspection with the memorandum of remedies of any deficiencies reported by the inspection.

B. Duties and limitations of authority:

1. Perform specified inspections, sampling, and testing of materials and methods of construction and promptly submit five copies of the written report of each test and inspection to the Designer.

2. Laboratory is not authorized to release, revoke, alter or enlarge on requirements of the Contract Documents, approve or accept portions of the Work, or perform duties of the Contractor.

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 GENERAL

1.01 GENERAL QUALITY CONTROL

A. Maintain quality control over products, services, site conditions and workmanship, to produce work of specified quality.

1.02 WORKMANSHIP

A. Comply with industry standards except where more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship

B. Perform work by persons qualified to produce workmanship of specified quality.

1.03 MANUFACTURER'S INSTRUCTIONS

A. When specification sections require that installation of work shall comply with manufacturer's printed instructions, a copy of the instructions shall be maintained at the project site during installation and until completion and acceptance.

B. Handle, install, connect, clean, condition, adjust and finish products in strict accordance with such instructions and comply with specified instructions.

1. Should project conditions or specified requirements conflict with manufacturer's instructions review with the Architect for further instructions.
2. Do not proceed with work without clear instructions.

1.04 MANUFACTURER'S CERTIFICATES

A. When required by specified sections, submit three copies of manufacturer's certificates that certify the products meet or exceed specified requirements.

1.05 MANUFACTURER'S FIELD SERVICES

A. When specified in specification sections, require supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up equipment, test, adjust, and balance of equipment as applicable.

B. Submit manufacturer's written report listing observations and recommendations to the Architect.

1.06 TESTING AND INSPECTION SERVICES: See Section 01 43 25.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 PROJECT CONDITIONS

A. This Section is not intended to limit types and amounts of temporary construction facilities and controls required. Omission from this Section will not be accepted as an application that such temporary activity is not required for successful completion of the work and compliance with requirements of the Contract Documents.

B. Provide and maintain each temporary construction facility and control when required for proper performance of the work. Terminate and remove when no longer needed or when permanent facilities, with proper authorization, are available for use.

C. Obtain and pay for all required applications, fees, permits and inspections required for temporary construction facilities and controls.

D. Install, operate, maintain and protect temporary construction facilities and controls in a manner and at locations which are safe, non-hazardous, sanitary and adequately protect project work, workmen and the public.

1.02 COST OF CONSUMED UTILITIES

A. Water Service Use Charges: Water consumed during construction is to be metered and paid for by the Owner.

B. Electric Power Service Use Charge: Cost of electric power consumed during construction is to be metered and paid for by the Owner.

1.03 REQUIREMENTS OF REGULATORY AGENCIES

A. Provide and maintain all temporary facilities in compliance with governing rules, regulations, codes, ordinances and laws of agencies and utility companies having jurisdiction over work involved in project.

B. Be responsible for all temporary work provided, and obtain any necessary permits and inspections for such work.

C. Contractors shall confine equipment, storage of materials, and operation of workmen to the limits indicated or directed and shall abide by law, ordinances, conditions stated in permits and directions of the Architect.

D. Do not interfere with normal use of roads in vicinity of project site except as indicated or as absolutely necessary to execute required work, and then only after

proper arrangements have been made with authorities having jurisdiction, including traffic control as applicable.

1.04 SPECIAL PRECAUTIONS AND REQUIREMENTS

A. Do not interfere with normal use of occupied areas in existing (adjacent) buildings, existing driveway access to existing adjacent buildings and existing building utility services, except as absolutely necessary to execute required work involving such facilities, and then only after proper arrangements have been made through the Owner with persons in charge of existing facilities.

B. Do not block required exits from existing buildings.

1.05 TEMPORARY FIELD OFFICES, TRAILERS AND TELEPHONE

A. Provide and maintain clean weather tight offices at the site for own use and the Architect and at which location he/she or his/her authorized agent shall be present, or to which either may be readily called at all times while the work is in progress.

1. Provide field office heated, lighted and provide with telephone service. All expenses in connection with the field office, including the installation cost and use cost of heat, air conditioning, light, water and janitor service.

B. Copies of permits, approved shop drawings, plans and specifications marked up-to-date with all revisions and all addenda shall be kept at said offices areas ready for use at all times.

C. All expenses in connection with Contractor's field offices, including the installation cost and use of telephones, shall be borne by the Contractor.

D. Maintain field office areas until final acceptance and then remove, unless the Architect orders or approves earlier removal.

E. Pay all costs, including utility installation costs to the field office.

F. Provide and maintain such additional storage trailers on the project as required. Located where directed by the Architect.

G. Contractor may be required to relocate their offices, as directed by Architect, during construction as work progresses.

1.06 TEMPORARY SANITARY FACILITIES

A. Provide temporary portable toilets, acceptable to public health authorities, as required to service the project. Maintain in a clean, sanitary condition. Locate as directed by Architect.

1.07 TEMPORARY WATER SERVICE

A. General: Water is available from water main indicated on site drawings.

B. Arrange for, provide and pay for temporary water connections to water main, installation of metered extension and suitable fixtures at termination of lines.

C. Provide sufficient branch lines of adequate size to serve the needs of all trades. Locate water supplies at convenient locations, as directed by Architect.

D. Provide insulated housings for temporary service lines to protect against freezing, when applicable.

1.08 TEMPORARY HEAT AND VENTILATION

A. Prior to permanent enclosure of the structure, provide temporary heat as necessary to complete the work.

1. Provide weather protection as required to carry on work during inclement weather and to protect work and materials from damage by weather.
2. Protection of work includes covering, temporary enclosures, heating materials and work under construction and for providing suitable working conditions.
3. Furnish temporary heat by Owner approved types of units or equipment which is safe, will not affect surrounding areas of Contract Work and is properly supervised while in use.

B. "Permanently enclosed" shall mean that permanent walls and roofs are in place and weather tight, windows are in place and glazed and all entrance enclosures are either permanently in place or provided with suitable temporary enclosures.

1. Polyethylene sheet is not considered a suitable temporary enclosure. One-half inch thick plywood tightly fit, sealed and supported and maintained can be considered a temporary enclosure.

C. After the structure is permanently enclosed, provide, operate and maintain until substantial completion, approved temporary heating and ventilating units to maintain that portion of the structure at suitable temperature and humidity conditions to complete the work.

1. Arrange temporary units to bring in sufficient outdoor air to ventilate the structure and to prevent build-up of harmful dusts and fumes and to remove excess moisture. During warm weather, provide an adequate supply of fresh air, when necessary, to properly ventilate moisture, dust, fumes from paints, cements or adhesives in tightly-enclosed areas where natural ventilation will not be sufficient.
2. Provide temporary heating and ventilating as follows:
   a. During normal working hours, minimum 50^{o} F.
   b. During placing, setting and curing of concrete, minimum 50^{o} F.
   c. For 10 days prior to placing interior finish materials and throughout interior finishing, painting, etc., and until final acceptance of work and occupancy by Owner, minimum 70^{o} F.
   d. Supply heat and ventilation in a manner which avoids rapid drying of material but permits material and building to dry so remaining

moisture will not affect finish material.

e. Operate temporary systems each day, including Saturdays, Sundays and holidays. Include necessary labor and approved operating personnel.

f. Supply all fuel required for temporary heating and ventilating, including all material, labor and supervision to connect same.

D. When permanent systems are used for temporary construction use, Contractor shall assume full responsibility for maintaining such equipment during and after use. Included in maintenance are the following:

1. Proper operation and maintenance of the mechanical equipment until acceptance of the project by Owner.
2. Maintenance of temporary filters in all equipment to prevent accumulation of dust and dirt in coils, housings and ductwork.
3. Prior to final inspection; replacement of temporary filters with new filters, thorough cleaning of coils and other equipment, putting entire system into first class condition, cleaning traps and devices, adjustment and removal of any and all materials and equipment not functioning properly.
4. Owner and Architect must be given access to and opportunity to inspect equipment and maintenance procedures at all times. Owner involvement will not relieve the Contractor from the responsibilities specified herein.

E. Use of permanent heating or cooling and ventilating equipment for temporary construction use shall not effect warranty. Warranty shall take effect at time of project acceptance by Owner.

F. Cost of Temporary Heat: Cost of all fuel consumed in conjunction with temporary heat or permanent system used for temporary heat shall be paid by the Contractor.

1. Electric resistance type heating units are not permitted.

G. During periods of extremely low temperatures when water pipes could possibly freeze or when such conditions are forecast, temporary heating must be monitored 24-hours a day, 7 days a week.

1.09 TEMPORARY LIGHT AND POWER

A. Provide necessary temporary electrical service and temporary wiring and outlets as required to meet project needs for temporary lighting and power at the start of the project, as work progresses and until acceptance by the Owner, excluding power to individual contractor's trailers.

B. Extend temporary service from public utility service. Provide meter and extend service with disconnect to central location on site and to electric panel board location near Contractors' office trailer area. Provide system sized as required to service project construction needs.

C. Construct temporary pole line as required.

D. Remove temporary service, light and power system when permanent services and systems are available for use. No temporary system component shall form a part of the permanent systems.

E. Electrical work for construction purposes shall conform to Federal, State and local safety requirements, as well as requirements of the National Electrical Code. Obtain and pay for required applications, permits and inspections pertaining to this work.

F. Provide all lamps required to service the project. Replace lamps and fuses throughout the life of the project.

G. Pay all costs for installation, maintenance, supervision and removal of temporary light and power systems.

H. Make connections for temporary heat. Check temporary heat requirements.

I. Temporary Lighting

1. Provide as required to service the project.
2. As interior partitions are erected, revise the temporary lighting arrangements so that not less than one lamp is provided in each space over 70 square feet in area. Lights shall also be installed, as directed by Architect, in smaller areas where required to provide adequate light for work being carried out in the space.

J. Both 240 volt and 120 volt power receptacles are required on the project.

1.10 CONSTRUCTION AIDS

A. Hoists and Cranes: Erect and maintain adequate hoisting facilities as required for the work.

B. Shoring and Bracing: Provide all shoring and bracing required for safety and proper execution of their work. Remove these items when the work is completed.

C. Temporary Partitions: Provide temporary dustproof, security partitions in corridors, door openings and wall openings separating new work from existing building. Construction methods and materials shall be approved by Architect prior to construction of partition. However, construction shall be similar to plywood sheathing over wood studs with 6 mil plastic film applied over sheathing sealing all joints. Seal partitions at floor, walls and ceilings.

1. Provide doors through temporary partitions with self closing devices and locks.

1.11 WEATHER PROTECTION

A. Protect work and existing or adjacent property against weather, to maintain work, materials, apparatus and fixtures free from injury or damage during the entire

construction period. Work likely to be damaged shall be covered or protected at the end of each day's work. Any work damaged by failure to provide protection required, shall be removed and replaced with new work at the Contractor's expense.

B. Remove all snow and ice as may be required for proper protection and execution of the work and protection and safety of the public.

C. Provide winter weather closures and temporary doors at all unclosed openings.

1.12 WATCHMAN SERVICE

A. If Contractor considers watchman services necessary or desirable for protection of his/her own interest, such services may be employed at his/her own complete expense.

1.13 SAFETY

A. Safety requirements shall be in accordance with the General Conditions.

B. Provide and maintain guard lights at all barricades, railings, obstructions in the roadways or sidewalks and at all trenches or pits adjacent to walks or roadways.

C. Strict attention and full adherence must be given the Williams-Steiger Occupational Safety and Health Act of 1970, U.S. Department of Labor.

1.14 SECURITY CONDITIONS

A. Security of building must be maintained during "non-standard" working hours (premium time). This includes, but is not necessarily limited to, verifying all entrance doors and windows are secured.

B. Contractor shall be responsible for all infractions of rules and regulations by his workers.

C. Loitering or wandering through the corridors and into rooms not connected with the project or into other buildings on site will not be permitted.

D. Erect a 6 foot high fence with gates to enclose construction site from all or part of the campus, provide:

1. Wire mesh (farm fence) or chain link type fabric with steel posts.
2. Locate where directed by the Owner
3. Provide metal gates, of same fabric as metal fence, where indicated.
4. Maintain fence and gates in working order at all times.
5. Except during working hours, keep gates locked at all times.

1.15 DUST CONTROL

A. Control dust originating within project limits using water or a dust palliative

acceptable to the Architect. When conditions create blowing dust and dirt that is considered higher than that normally encountered, Contractor shall cooperate with Architect in determining methods to help minimize blowing. This may involve, as a minimum, more frequent applications of dust palliative. Calcium chloride may not be used.

1.16 TEMPORARY SIGNS

A. Temporary Project Sign

1. Provide project sign approximately 4 feet by 8 feet.
2. Painting by professional sign painter, with text, design, layout and colors as directed by Architect.
3. Materials: 3/4" APA-AB-EXT. Plywood for sign face with pine or fir trim. Provide 4 x 4 treated wood posts of sufficient length and quantity to securely brace and support sign against wind pressure.
4. Locate sign as directed by Architect. Maintain until completion of project, then remove. Erect sign a minimum of 8 feet from public right of way.

B. Temporary Directional Signs: Provide as required to adequately direct traffic and personnel on site.

1.17 STREETS AND TRAFFIC

A. Cleaning and Repair

1. Contractors shall remove mud and spillage from public walks, streets and sewers without delay. Failure to clean areas promptly will result in areas being cleaned by the Owner at the responsible Contractor's expense.
2. Damage to roads or other facilities on the grounds, resulting from hauling, storage of materials, or other activities in connection with the work shall be repaired or replaced, at no expense to the Owner, by the Contractor causing the damage. Repairs or replacements shall be made to the satisfaction of the Architect.

B. Traffic

1. Notify local law enforcement agency at least two weeks in advance of any anticipated work affecting traffic flow.
   a. To assure maintenance of flow and to safeguard all parties involved in planning to maintain flow, a field inspection should be made jointly by the Architect and Contractor personnel before performing any work which would interrupt normal traffic patterns.
   b. Re-routing of traffic shall be planned, as to route and direction, in cooperation with the local law enforcement agency.

1.18 PARKING

A. Employees of Contractors and subcontractors must park vehicles in areas assigned to them. Parking on streets or in restricted areas is prohibited.

1.19 FIELD ENGINEERING

A. Employ a registered surveyor, registered in the State of Tennessee to lay out the building on the site and to locate and fix all site items such as site improvements and utilities and furnish a certified plat of this work.

B. Be responsible for accuracy of all lines, elevations and measurements of the work.

C. Exercise proper precaution to verify dimensions shown on Drawings before layout of the work.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Requirements of this Section apply to the Work of all other Sections.

B. Section Includes:

1. Transportation and Handling.
2. Storage and Protection.
3. Standards.
4. Manufacturers and Types.
5. Fabrications.
6. Shop Priming.
7. Prohibited Materials and Methods.

1.02 RELATED SECTIONS

A. Quality Control: Section 01 45 00.

B. Cutting and Patching: Section 01 73 29.

C. Shop Drawings, Product Data and Samples: Section 01 33 23.

D. Execution Requirements: Section 01 73 00.

1.03 STANDARDS

A. Standards, codes and regulations published by Manufacturer's Associations, governmental agencies and other regulatory authorities form a part of these Specifications as minimum requirements. Such references include the latest issue and all amendments up to 30 days prior to the Bid Date.

B. "Governing Authority" means all federal, state and local laws and regulations.

C. Where differences occur between the Contract Documents and such standards, the most restrictive requirement shall apply.

D. Supply all materials and perform all work in accordance with the Manufacturer's Specifications and installation procedures, and in conformance with published trade and manufacturer's association standards, unless specifically noted otherwise herein.

1.04 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site.

1. Transport products by methods to avoid product damage.
2. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
3. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and accepted submittals, and that products are properly protected and undamaged.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

1.05 STORAGE AND PROTECTION

A. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

B. Store products in accordance with manufacturer's instructions with seals and labels intact and legible.

1. Store products subject to damage by the elements in weathertight enclosures.
2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

C. Exterior Storage

1. Store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. Cover products which are subject to deterioration with impervious coverings.
   Provide adequate ventilation to avoid condensation.
2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign materials.

D. Arrange storage in a manner to provide access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage.

E. Protection After Installation: Provide coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

PART 2 PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS

A. Products include materials, equipment and systems.

B. Products incorporated into the work:

1. Comply with specifications and referenced standards as minimum requirements.
2. Manufactured and fabricated products:
   a. Design, fabricate and assemble in accordance with the best engineering and shop practices.
   b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
   c. Two or more items of the same kind shall be identical, by the same manufacturer.
   d. Products shall be suitable for service conditions.
   e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing by the Architect.
4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.
5. New and unused, except as otherwise indicated.

2.02 MANUFACTURERS AND TYPES (MODELS)

A. In some instances the Project has been designed around a specific manufacturer. In some sections of the specifications, other manufacturers are listed as acceptable. Equipment or materials from these manufacturers will be acceptable contingent upon their meeting the design, appearance and functional standards established by the specified items. If equipment or a material of an acceptable manufacturer requires changes; electrically, mechanically, structurally, from what is indicated on the drawings, it shall be the responsibility of the Contractor requiring such change, to pay all costs involved with no additional costs to the Owner.

B. Where more than one manufacturer or specific product is listed, provide any one named. No substitutions will be permitted after signing the contract.

C. Equivalent components (articles, devices, materials, forms of construction, fixtures, etc.) may be submitted to the Architect for approval prior to bidding regardless of listed manufacturers.

D. Where a performance is specified and no manufacturer is listed, submit through the Shop Drawing procedure the name of the manufacturer, the product proposed, and detailed information showing its characteristics. Such proposal shall meet or exceed the specification, line item by line item, or be rejected.

E. Where a choice of color, pattern, or texture is available for a specified product or item of equipment, the Architect will make a selection from the manufacturers highest or best, unless noted otherwise in the specifications.

2.03 FABRICATION

A. Fabricate all items in the shop insofar as practicable. Where items cannot be completely shop fabricated and assembled for shipment, assemble and fit in shop, disassemble and ship. Identify parts for field assembly.

B. Fabricate items to be straight, square, in proper alignment, and with hairline joints where joints are necessary and permitted. Pre-plan field joints to be as inconspicuous as possible; coordinate locations with Architect.

2.04 SHOP PRIMING

A. Shop prime or seal surfaces of all products to receive paint materials in accordance with the requirements of Section 09 91 00.

B. Apply a primer or sealer compatible with the specified paint materials.

C. In the event such a primer is determined to be incompatible with the specified finish paint system, provide a barrier coat or remove the primer and reprime as directed, at no additional cost to the Owner.

2.05 PROHIBITED MATERIALS AND METHODS

A. The following items are expressly prohibited:

1. Attachment Related Items
   a. Powder Fasteners: Powder fasteners are defined as anchors which are driven into place by any device which produces an impact force by use of a powder charge, compressed air, gas or any other propellent. Powder fasteners prohibited for the following conditions:
      1) Attachment of structural members.
      2) Where public may be endangered by misuse.
   b. Plug anchorage by use of wood, lead or plastic.
   c. Perforated steel strap iron for pipe or other support or anchorage.
   d. Suspension systems that are not independently supported.
      1) Ceiling grid systems shall not be supported from ductwork, electrical conduit, heating or plumbing lines, and vice versa.
      2) Each utility system and the ceiling system shall be a separate installation, each independently supported from the building structure.
      3) Where interference occurs, provide trapeze type hangers or other suitable supports for each system.
      4) Locate hangers and supports where they will not interfere with access to mixing boxes, fire dampers, valves, and other appurtenances requiring servicing.
2. Methods Related Items
   a. The penetration of floors and walls by pipes, ducts, or other penetrations unless openings are appropriately fire stopped by fire doors or fire dampers, and voids around pipes, ducts, conduits, etc. are sealed with fireproof materials.
   b. The use of ink marking pens on surfaces of any kind of materials receiving paint or other finish in exposed location.

3. Materials Related Items
   a. Asbestos or asbestos containing materials.
   b. Barbed wire in construction fencing.
   c. Water soluble treatment of insulation jackets or facings, to impede or retard smoke or flames.
4. Door Related Items
   a. Knock-down (KD) door frames.
   b. Thresholds raised more than 1/2" at doors indicated as wheel chair accessible.

PART 3 EXECUTION

Not Applicable

END OF SECTION

SECTION 01 62 25
PRODUCT OPTIONS and SUBSTITUTIONS

PART 1 - GENERAL

1.01 ENVIRONMENTAL HAZARDOUS PRODUCTS, MATERIALS, OR WASTES

A. Do not incorporate in the Work hazardous materials or products as currently defined in the Resource Conservation and Recovery Act of 1976 (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), or Environmental Protection Agency (EPA) regulations, rules, or requirements, as amended, unless the Contract Documents give no other option than to provide a material or product which contains a hazardous material, component, constituent, waste, or leachate. In studying the Contract Documents and carrying out the Work, report at once to the Designer the discovery of a product or material which contains hazardous materials, components, constituents, waste, or leachate.

B. Do not incorporate in the Work a product or material which contains concentrations of a constituent, component, or material above the threshold levels which would require adherence to hazardous waste disposal regulations as currently defined, or could cause a release or threat of release of a hazardous substance at a level that would require a remedial response or removal action as currently defined by RCRA, CERCLA, or the EPA.

C. Select materials and products meeting specified requirements which comply with EPA requirements as regards hazardous materials content. In making requests for substitutions, determine that materials and products proposed for substitution comply with RCRA, CERCLA, and EPA requirements.

1.02 SUBSTITUTIONS:

A. Requests for substitutions shall be submitted to Designer on the form exhibited as Section 01 62 32, or in a similar format which provides the same or more information. Substitute products should not be ordered and shall not be installed without written approval or acceptance from Designer. Contractor assumes all risks associated with premature ordering and installation of substitute products.

B. The specifically named manufacturers, products, and systems, and descriptive characteristics used in the Contract Documents normally serve only to establish a level of quality and a performance standard. Unless specific restriction is placed upon an item in the specifications, Contractor may submit proposals for substitutions. The Owner reserves the right to disallow substitutions. Contractor assumes risks associated with possible rejection of proposals for substitution submitted during the life of the contract.

C. Delays caused by tardiness of Contractor in preparing and forwarding submittals do not constitute an acceptable basis for consideration of substitute products. Delays due to factors which were in effect prior to project bidding do not constitute an acceptable basis for consideration of substitute products.

D. When making requests for substitutions, Contractor assumes the following reponsibilities:

1. To have personally investigated the proposed substitute product and determined it is equal or superior in all respects to that specified;
2. To provide the same warranty for substitute that Contractor would for that specified;
3. To provide complete cost data, and waive all claims for additional costs related to substitution which subsequently become apparent; and
4. To coordinate installation of the accepted substitute, making such changes as may be required for Work to be complete in all respects.

END OF SECTION

SECTION 01 62 32
SUBSTITUTION REQUEST FORM

To:	**Project:**
Attn:	
Specified Item:	**Proposed Substitute:**

1. The following are attached (Mark all that apply):

☐ **Complete Description** ☐ **Catalog**
☐ **Laboratory Tests** ☐ **Spec Data**

2. This substitution will have the following effects on dimensions, guages, weights, etc.:

3. This substitution will have the following effects on wiring, piping, ductwork, etc.:

4. This substitution will have the following effects on other trades:

5. This substitution will have the following effect on construction Schedules:

6. The proposed substitute(s) differs from the specified product(s) in quality and performance as follows:

7. Manufacturers guarrantees for the substitute(s) and the specified product(s) are (check one):

☐ **the same** ☐ **different** (if different, explain below)

8. Information on the availability of maintenance services and replacement materials for proposed substitute(s) is provided on an attached sheet if applicable. This attachment is:

☐ **attached** ☐ **not applicable**

9. Names, addresses, and phone numbers of fabricators and suppliers for proposed substitute(s) are provided on an attached sheet if applicable. This attachment is:

☐ **attached** ☐ **not applicable**

10. If the proposed substitution is accepted, it will result in:

☐ **no cost impact** ☐ **a cost increase of**

☐ **a cost decrease of** _____

(If change in cost is indicated, itemization on specified Cost Itemization Form is attached)

11. License fees or royalties are pending on the proposed substitute.

☐ **No** ☐ **Yes** (if yes, explain below)

12. The undersigned or the firm represented shall pay for additional studies, investigations, submittals, redesign, and analysis by the Designer necessitated by this substitution request.

Substitutions must be requested in accordance with applicable Contract requirements. After bidding, substitutions are to be submitted only by Contractor. Substitute products should not be ordered or installed without written acceptance.

Submitted by: **Date:**

Sign here: _____ _____

Name: **Telephone:**

type or print: _____ _____

for:

Name of firm: _____

Address:

Street address: _____

and mailing address if different: _____

City, State, and Zip Code: _____

Designer's Review Comments:

☐ **Accepted** ☐ **Rejected**

☐ **Accepted as noted** ☐ **Rejected (received too late)**

☐ **Rejected (submittal incomplete)**

Additional comments:

For the Designer: **Date:**

Signature here: _____ _____

SECTION 01 73 00

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Requirements of this Section apply to the Work of all other Sections.

B. Section Includes:

1. Examination of Substrate.
2. Preparation.
3. Installation.
4. Workmanship.
5. Protection.
6. Overhead Attachments.

1.02 RELATED SECTIONS

A. Quality Control: Section 01 45 00.

B. Cutting and Patching: Section 01 73 29.

C. Submittal Procedures: Section 01 33 23.

D. Product Requirements: Section 01 60 00.

1.03 STANDARDS

A. Standards, codes and regulations published by Manufacturer's Associations, governmental agencies and other regulatory authorities form a part of these Specifications as minimum requirements. Such references include the latest issue and all amendments up to 30 days prior to the Bid Date.

B. "Governing Authority" means all federal, state and local laws and regulations.

C. Where differences occur between the Contract Documents and such standards, the most restrictive requirement shall apply.

D. Supply all materials and perform all work in accordance with the Manufacturer's Specifications and installation procedures, and in conformance with published trade and manufacturer's association standards, unless specifically noted otherwise herein.

1.05 NON-CONFORMING WORK

A. Faulty work or work not in conformance with the Contract Documents will not be permitted by the Architect.

1. It is the responsibility of the Contractor to propose a remedy by means of detailed drawings and written documentation and submit such documentation to the Architect for comments.
2. All costs for the removal and reconstruction of such work, as well as additional services of the Architect, shall be paid for by the Contractor.

PART 2 PRODUCTS - NOT APPLICABLE

PART 3 EXECUTION

3.01 EXAMINATION OF SUBSTRATE

A. Examine the substrates or structure to which a product is to be applied or installed. Do not proceed until unsatisfactory conditions have been corrected. Starting the work indicates acceptance of conditions and the installer assumes full responsibility for results.

B. Check the substrate or structure for proper tolerances and clearances. Tolerances are listed under individual specification Sections.

3.02 PREPARATION

A. Substrate: Where the products are applied to a substrate, prepare the substrate as recommended by the product manufacturer. That generally includes the following:

1. Bringing substrate to a uniform surface by smoothing uneven surfaces and filling holes, cracks and depressions with recommended filler or compatible type material.
2. Depressed Slabs: Bring to required elevation to receive finished materials where finished materials cannot completely fill depression. Use approved cementitious filler or compatible type material. Coordinate depressed slab locations with finish material locations.
3. Remove substances such as dust, oils and other foreign matter, not compatible with the product.
4. Surfaces shall be dry, unless moisture content or wetting requirement is specified or recommended.

B. Concrete Slabs: Provide steel shot abrasive cleaning of concrete slabs receiving designated finish flooring materials.

1. Designated Finish Flooring Materials
   a. Cementitious or cementitious set materials.
   b. Sheet flooring materials.
   c. Waterproofing materials.
   d. Paint materials.

e. Polymer or epoxy type seamless flooring.

2. Equipment: Electric powered portable unit with self-contained dust collection system. Size(s) of unit(s) and shot media suitable for conditions and proposed finish materials. WHEELABRATOR CORP. (800/544-4144) "Blastrac" or similar type system by SASE COMPANY INC. (800/522-2606), BW MANUFACTURING (616/447-9076) or INNOVATECH (800/267-6682).
3. Cleaning: Remove concrete surfaces to sufficient depth to remove bond breakers and contaminants such as curing compounds, oils, and other foreign matter which may be detrimental to the completed flooring installation.
   a. Work smoothly and evenly over entire surface; avoid creating dips, ridges, or other imperfections which would show or telegraph in the completed installation.
   b. Small transitions for different flooring materials may be obtained by multiple passes if carefully executed to create smooth even slope of not more than 1/8" in 2 feet.
4. Clean floor as near as possible to flooring installation to avoid contamination from work of other trades. Protect clean floor from soiling with suitable sheet materials. Reclean soiled areas.

C. Inserts and Anchorages

1. Anchorages where not detailed are the responsibility of the installer to design a suitable connection, structurally sound, and aesthetically acceptable to the Architect. Furnish calculations, drawings and product data when requested by the Architect. Such information may or may not be returned as indicated in Section 01 33 23.
2. It is the responsibility of the installer to furnish built-in fastening devices for his/her product to the proper trade for installation as the work proceeds.
3. In the event such devices are not furnished in time to be built-in, it is the installer's responsibility to provide other methods for attaching their product. Submit drawings and other required data to the Architect.

D. Templates: Provide templates, diagrams and other coordinating documents to the proper Contractor, manufacturer or supplier of related items affecting the Work.

E. Dimensions

1. If the exact location of an item is not indicated by dimension on the Drawings or noted in the Specifications, the Architect reserves the right to determine such location in the field prior to roughing-in.
2. If the exact dimensions of a product are not indicated, the Architect reserves the right to determine dimensions prior to the ordering or fabrication of a product.
3. Such dimensional changes shall not be a basis for changes in the Contract Sum.
4. Where miscellaneous devices, such as thermostats, switches, controls, grilles, pipes, or outlets of any nature are not specifically located by the Contract Documents, request such location or obtain approval of the

location prior to installation. If approval has not been obtained, the Architect may direct the relocation of such devices at the expense of the installer.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's recommendations or the requirements of trade associations, listed standards, Shop Drawings and Contract Documents.

B. If a conflict exists between these references, the most strict requirements govern. If printed instructions are not available, consult with the manufacturer or the manufacturer's field representative, where applicable.

C. Provide hangers, auxiliary framing, and other means for installing ceiling suspension systems, lighting fixtures, diffusers, and other equipment in ceilings to avoid ductwork, piping, etc.

1. Suspend from structural members (i.e. joists, beams, etc.), and not from ductwork or piping.
2. Provide supplemental framing members (i.e. angles, tubes, light gage steel framing, etc.) to span between structural members where required to support items of this paragraph C.

D. Install work that will not interfere with the proper installation of the Work of other trades.

E. Install work in a manner to facilitate operating, servicing and repairing.

F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

G. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.04 WORKMANSHIP

A. Install products straight, plumb, level and in line. Securely attach items to the substrate, using recommended adhesives, mechanical fasteners or other devices. Where holes are provided for attachment, do not field drill or cut new holes without the approval of the Architect.

B. Where applicable, match finished work to the approved samples or mock-ups.

C. Conceal fasteners wherever possible, unless exposed fasteners are permitted or specified.

D. Weld in accordance with AWS standards; comply with AWS for qualifications of

operators and for workmanship.

E. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

F. Recheck measurements and dimensions, before starting each installation.

3.05 PROTECTION

A. Protect finished surfaces of product being installed and surrounding products from damage during installation. Provide protective devices as required and as recommended by the manufacturer. Cover work subject to damage at the end of each day's work.

B. Coat concealed surfaces of metal products with a bituminous or other approved coating to prevent contact between dissimilar metals or other material which can cause deterioration.

C. Correct damage by repairing or replacing as directed by the Architect. Repairing will be permitted only where the repair is undetectable and does not cause structural damage or interfere with proper functioning of the part.

D. Protect finish of installed products until Substantial Completion of the Project by use of wrappings, covers or other approved protective devices. Remove such protection immediately prior to final cleaning.

E. Limiting Exposures: Coordinate and supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.06 OVERHEAD ATTACHMENTS

A. Where overhead hangers are required, and not indicated on the drawings, provide one or more of the following as required:

1. Concrete inserts prior to placement of concrete or drilled type inserts after concrete is placed.
2. Trapeze from adjacent structure with suitable steel framing.
3. Connections to Structure: Suitable anchorage devices with a minimum load carrying capacity of 250 pounds plus safety factor of 4:1 for the applied load.
    a. Concrete: Steel expansion anchors. See Prohibited Material and Methods specified in Section 01 60 00.
    b. Steel: Bolted or welded connections to steel structure.

B. Where metal deck is furnished with hanger tabs or similar devices, applied total load, including work of other trades, not to exceed 75 pounds for each device. Loads in excess of permitted limit to be supported by trapeze framing as specified

above.

C. Verify support requirements of heavy or unusual loads not specifically shown on drawings with Architect.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 GENERAL

1.01 DESCRIPTION

A. Execute cutting, fitting or patching of Work, required to:

1. Make several parts fit properly.
2. Uncover Work to provide for installation of ill-timed Work.
3. Remove and replace defective Work.
4. Remove and replace Work not conforming to requirements of Contract Documents.
5. Remove samples of installed Work as specified for testing.
6. Install specified Work in existing construction.

B. In addition to contract requirements, upon written instructions of Architect:

1. Uncover Work to provide for Architect's observation of covered Work.
2. Remove samples of installed materials for testing.
3. Remove Work to provide for alteration of existing Work.

C. Do not endanger any Work by cutting or altering Work or any part of it.

1.02 SUBMITTALS

A. Prior to cutting which affects structural safety of Project, submit written notice to Architect, requesting consent to proceed with cutting, including:

1. Identification of Project.
2. Description of Affected Work.
3. Necessity for cutting.
4. Affect on other Work, on structural integrity of Project.
5. Description of proposed Work. Designate:
    a. Scope of cutting and patching.
    b. Contractor and trades to execute work.
    c. Products proposed to be used.
    d. Extent of refinishing.
6. Alternative to cutting and patching.

B. Should conditions of Work, or schedule indicate change of materials or methods, submit written recommendation to Architect, including:

1. Conditions indicating change.
2. Recommendations for alternative materials or methods.
3. Submittals as required for Substitutions.

C. Submit written notice to Architect, designating time Work will be uncovered, to provide observation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching of materials and surfaces shall be in accordance with the requirements of the Contract Documents. Where not otherwise defined, patching shall match adjacent surfaces and proper materials shall be provided accordingly.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of Work, including elements subject to movement or damage during cutting and patching.

B. After uncovering Work, inspect conditions affecting installation of new products.

3.02 PREPARATION PRIOR TO CUTTING

A. Provide shoring, bracing and support as required to maintain structural integrity of Project.

B. Provide protection for other portions of the Project, including all Contractors' personnel.

3.03 PERFORMANCE

A. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances, finishes.

B. Execute cutting and demolition by method which will prevent damage to other Work, and will provide surface to receive installation of repairs and new Work.

1. No cutting shall be performed which will, in any way, reduce the structural strength of the building. Should such cutting be necessary, consult Architect and do not proceed with such operation unless written approval is given.

C. Restore Work which has been cut or removed; install new products to provide completed Work in accord with requirements of Contract Documents.

D. Patching of materials and surfaces shall be in accordance with the requirements of the Contract Documents. Where not otherwise defined, patching shall match existing or adjacent surfaces and proper materials shall be provided accordingly.

1. Wherever existing walls, floors, ceilings, etc., are cut, the exposed surfaces

must be neatly finished by patching, painting, wall covering, etc., as required to blend patched areas into adjacent existing surfaces. Patched areas shall not be visible when viewing entire wall surface.

2. Where painting or finishing of patched surfaces or application of wall or floor covering is required, finish the entire plane of surface in which patched area occurs.

3.04 SLEEVES AND OPENINGS

A. Where pipes, conduits, ductwork or other materials pass through new walls, partitions, floors, roof or ceilings, provide suitable sleeves in these elements or provide openings where sleeves are not practical.

B. Close sleeves and openings to prevent passage of smoke or fire using approved methods and materials to maintain the fire rating of the construction being penetrated. See Section 07 84 00.

1. Unless otherwise indicated, extend floor sleeves 2" above finished floor.

C. Where pipes, conduit, ductwork etc., pass through, behind, or above existing construction, provide all cutting, patching, and refinishing for doing this work as specified herein.

D. Penetrations under beams or other concentrated loads require approval of Architect.

END OF SECTION

SECTION 01 74 00

CLEANING

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Execute cleaning, during progress of the work and at completion of the work (final cleaning), as required by Contract Documents.

1.02 WORK SPECIFIED IN OTHER SECTIONS

A. Cutting and Patching: Section 01 73 29.

B. Cleaning for Specific Products or Work: Specification section for the work.

1.03 CLEANING AND DISPOSAL REQUIREMENTS

A. Standards: Maintain project in accord with the following safety and insurance standards:

1. Applicable Federal and State Requirements.
2. National Fire Protection Association.

B. Hazards Control: Comply with the following requirements:

1. Store volatile wastes in covered metal containers, and remove from premises daily.
2. Prevent accumulation of wastes which create hazardous conditions.
3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on project site.
2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary sewers.
3. Do not dispose of waste into streams or waterways.
4. Wet down dry materials and rubbish to prevent dust.

D. Clean streets, highways, and private properties of all mud, earth, rubbish, rocks, refuse or other debris of any kind resulting from such work or related transportation to and from the work site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Select and use cleaning materials and equipment with care to avoid scratching, marring, defacing, staining or discoloring surfaces cleaned.

B. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

C. Use cleaning materials only on surfaces recommended by the cleaning material manufacturer.

PART 3 EXECUTION

3.01 DURING CONSTRUCTION

A. Provide, maintain and empty 55 gallon metal and dumpster type containers for collection of waste materials, debris and rubbish. Locate containers as directed by Architect.

1. Provide containers with adequate capacity to accommodate anticipated needs. If containers do not have adequate capacity, increase intervals of waste removal or capacity of containers until adequate capacity is provided.

B. At reasonable intervals during progress of Work, but in no case less than once a week, clean site and public properties and dispose of waste materials, debris and rubbish.

C. Direct Special Attention To:

1. Provide non-staining layout lines and other markings on masonry and concrete. Use chalk lines wherever possible and remove when no longer needed.
2. Remove all stains from concrete surfaces, including floors.
3. Shop marks shall not appear on exposed surfaces of any item.
4. Remove concrete, mortar and paint spatters.
5. Clean both brick and concrete unit masonry.
6. Protect aluminum frames during construction and thoroughly clean upon completion of the installation.

D. Clean interior surfaces before start of finish painting and continue cleaning on an as-needed basis until painting is finished.

E. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

G. Vacuum interior building areas where work is performed prior to painting and other

finish work. Continue vacuum cleaning on an as needed basis until building is ready for occupancy.

H. Protect interior of ductwork during construction from accumulation of dirt, dust or debris.

I. Clean trash from all chases and concealed spaces before final enclosure.

3.02 FINAL CLEANING

A. At the completion of the work, remove all surplus material, false work, temporary structures, including foundations thereof, plants of any description and debris of every nature resulting from their operations and put the site in a neat and orderly condition.

1. Exposed painted ductwork to be brushed clean of dust.

B. Remove temporary protection and labels not required to remain

C. Clean surfaces of equipment; remove excess lubrication.

D. Remove debris, rubbish, dirt, etc. from open concealed spaces, chases and above ceilings.

E. Repair, patch and touch-up marred surfaces to specified finish, to match adjacent surfaces.

F. Maintain cleaning until Final Completion.

G. Employ experienced workmen, or professional cleaners for final cleaning.

H. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

I. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight-exposed interior and exterior surfaces, including light fixtures and lenses; polish surfaces so designated to a shine finish.

1. Clean finishes free of dust, stains, films and other foreign substances.
2. Clean transparent and glossy materials to a polished condition; remove foreign substances. Polish reflective surfaces to a clear shine.
3. Vacuum clean carpeted and similar soft surfaces.
4. Clean resilient and floor finishes as specified.

J. Remove waste, foreign matter, and debris from roofs, gutters, areaways, and drainage systems.

K. Remove waste, debris, and surplus materials from site. Clean grounds; remove stains, spills, and foreign substances from paved areas and sweep clean. Rake clean other exterior surfaces.

L. Clean plumbing fixtures to a sanitary condition.

M. Clean permanent filters of ventilating equipment and replace disposable filters when units have been operated during construction; in addition, clean ducts, blowers, and coils when units have been operated without filters during construction.

N. Clean light fixtures and lamps; polish lenses.

O. Clean dirt and debris from interior of all electrical panels and user accessible electrical enclosure boxes prior to installation of covers or in the case of hinged access doors, before final cleaning of adjacent space. Clean the exterior surfaces of all switchgear located in Mechanical and Electrical Rooms and spaces.

P. Clean dirt and dust from interior of air handling units before installing final filters. Wipe down the exterior surfaces of all HVAC equipment located in Mechanical Rooms and spaces.

Q. Prior to Final Completion, or Owner occupancy, Contractor shall conduct an inspection of sight exposed interior and exterior surfaces, and all work areas, to verify that the entire work is clean.

END OF SECTION

SECTION 01 77 70
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 PRE-CLOSEOUT SUBMITTALS

A. Submit required tabulations when Work reaches seventy-five percent completion; however, regardless of percent completion, submit not later than 30 days prior to the scheduled date on which Substantial Completion is required.

B. Submit tabulations of:

1. Equipment and systems for which the specifications require demonstrations or training, indicating relevant specification sections, scheduled time and place for demonstration and training sessions, and intended audience. Adjust schedule if instructed by Designer to do so.

2. Equipment and systems for which operating and maintenance data are required in the Operating and Maintenance Data Binders and related documents are required in the Project Data Binders.

3. Spare parts and extra materials required, indicating the relevant specification sections, and the appropriate party to whom the items are to be delivered.

1.02 REQUEST FOR CLOSEOUT INSPECTION

A. SUBSTANTIAL COMPLETION:

When Contractor considers Work substantially complete, Contractor shall submit to Designer:

1. written assertion that Work is Substantially Complete;

2. a list of items to be completed or corrected and dates scheduled for completion or correction of each item;

3. certification that orientation and training for facility maintenance personnel is complete or written assertion that such orientation and training will be certified prior to inspection;

4. written assertion that Operating & Maintenance Data Binders are complete and available or will be prior to inspection;

5. written assertion that Use and Occupancy Permit(s) are complete and available or will be prior to inspection; and,

6. written assertion that an application for payment will be prepared commensurate with the degree of completion and submitted at the Substantial Completion inspection.

B. FINAL INSPECTION:

When Contractor considers Work complete, Contractor shall submit to Designer:

1. certification that a qualified person authorized by Contractor has reviewed the Contract Documents and inspected the Work;

2. written assertion that the Work is complete and in accordance with Contract Documents and ready for Final Inspection;

3. written assertion that additional materials necessary to augment the Operating & Maintenance Data Binders with instructions for adding these to the Binders, or full replacement Binders, are complete and available or will be prior to inspection;

4. written assertion that Project Data Binders and Construction Record Documents are complete and available or will be prior to inspection; and,

5. an application for final payment

C. Upon receipt of an appropriate request for inspection, Designer will schedule an inspection meeting with Contractor, and Owner's representatives to determine the status of completion.

1.03 RESULTS OF CLOSEOUT INSPECTIONS

A. Should the Designer determine that Work is not complete to the degree asserted by Contractor, Designer will promptly notify Contractor in writing stating the deficiencies. Contractor shall take immediate steps to remedy deficiencies and make a request for Re-Inspection.

B. SUBSTANTIAL COMPLETION: Designer will prepare a Certificate of Substantial Completion accompanied by a list of items to be completed or corrected, and will submit Certificate to Contractor and to Owner for signature with an accounting of Liquidated Damages due, when Designer verifies that:

1. Work is Substantially Complete based on an inspection conducted pursuant to an appropriate request for Closeout inspection;
2. orientation and training for facility maintenance personnel is complete; and,
3. Operating & Maintenance Data Binders are complete and have been delivered to the Owner.

C. FINAL INSPECTION: Designer will certify that the Work is Complete, and will initiate Final Adjustments, when Designer verifies that:

1. Work is complete in accordance with Contract Documents based on an inspection conducted pursuant to an appropriate request for Closeout inspection;
2. orientation and training for facility maintenance personnel is complete; and,
3. additional materials necessary to augment the Operating & Maintenance Data Binders with instructions for adding these to the Binders, or full replacement Binders, are complete and have been delivered to the Owner.
4. Project Data Binders and Construction Record Documents are complete and have been delivered to the Designer.

1.04 RE-INSPECTION FEES: If the Work fails a Closeout inspection, and a subsequent inspection is requested and conducted based on Contractor assertion of the same stage of completion, Owner will compensate Designer for performing such Re-Inspection as additional services, and deduct the amount of such compensation from the Contract Sum by appropriate modification.

1.05 FINAL ADJUSTMENTS

A. When Designer has certified that the Work is complete, Designer will determine whether modification is needed to reflect appropriate adjustments to Contract Sum which were not previously effected. If such modification is needed, Designer shall assist the Owner in its preparation and deliver it to Contractor, who in the case of a change order, shall sign and return it to Designer.

B. When Designer has certified that the Work and needed modifications to the Contract are complete, and if necessary, Designer will instruct Contractor to submit a revised final application for payment.

1.06 ONE-YEAR CORRECTIVE INSPECTION

A. An inspection will be scheduled and conducted at project site prior to one year from date Substantial Completion was achieved, but as close to the end of that year as is reasonably possible.

B. The inspection will be attended by at least one representative each of Owner, Designer, and Contractor.

C. The inspection will confirm non-conforming items previously identified for correction by the Owner, and whether corrections have been completed or are still outstanding, and is intended to be an opportunity for Contractor to become aware of any outstanding corrections needed.

END OF SECTION

SECTION 01 78 21
CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.01 DATA BINDERS

A. Provide two complete sets in durable, commercial quality, plastic covered, three ring binders. Identify project and type of data on face and side.

B. Provide information required by Contract Documents, including:

1. Cover sheet giving complete project title and number, Contractor's name, address, phone number, superintendent's name, and related information.

2. Table of Contents identifying material in Binder, and identifying missing materials to be added later or certifying completeness of Binder.

C. OPERATING & MAINTENANCE DATA BINDERS

1. Provide Product Data, including: manufacturer; model number; names, addresses, and telephone numbers of suppliers, installers, and servicers; related information for repair, renovation, or additions.

2. Provide Operating and Maintenance Data, including: instructions and schedules for proper operation, maintenance, servicing, and lubrication with manufacturer's parts list, illustrations, assembly drawings, maintenance diagrams, and list of recommended lubricants and cleaning agents; as-installed control diagrams and coordination drawings with color coded piping and wiring diagrams; valve tag charts with numbers, locations, and functions; panel board circuit directories; and, list of materials and parts furnished for Owner. Review brochures and manufacturer's standard printed information for data pertaining to models other than those actually provided, and mark to clearly omit inapplicable information and identify units actually installed.

D. PROJECT DATA BINDERS

1. On the form exhibited as Section 01 78 88, provide a complete list of subcontractors and material suppliers, including dollar amount, company name, address, phone number, local representative, and information regarding minority-owned business status.

2. Provide Certificate of Substantial Completion, Use and Occupancy Permits, and Certificate(s) of Inspection or letter(s) of acceptance from governing authorities as apply.

3. Provide Contractor's warranty of the work.

4. Provide guarantees, warranties, bonds, certifications, maintenance agreements, service contracts, and related documents, including beginning date, duration, information about instances which might affect validity, and proper procedure in case of failure.

1.02 CONSTRUCTION RECORD DOCUMENTS: Keep the record copy of Contract Documents required by paragraph 3.11 of the Conditions in good condition and in the course of the Work, legibly mark these to record actual conditions of Work, including: location, depth, and identification of new and existing underground items, utilities, valves, tap points, equipment, service access, test points, and related features; field changes in dimensions and detail; changes by addenda or Modification; and, description and details of features for maintenance, service, replacement, or expansion of the Work.

END OF SECTION

SECTION 01 78 25
DATA BINDER RECEIPT

PART 1 - GENERAL

1.01 RELATED SECTIONS

Section 01 29 76 Payment Procedures
Section 01 77 70 Close-Out Procedures
Section 01 78 21 Close-Out Submittals

1.02 CONTRACTOR PREPARATION AND USE OF THIS FORM

A. Use this form or a reasonable facsimile to verify delivery of Data Binders. Fill in the identifying information following this paragraph, then use the prepared form as a receipt, for signature by the person to whom Data Binders are delivered. Provide a copy of the receipt with the application for payment.

1. For the Application for Payment commensurate with Substantial Completion, provide a copy indicating delivery of Operating and Maintenance Data Binders.

2. For the Application for Payment commensurate with Final Completion, provide a copy indicating delivery of Project Data Binders.

B. Identifying Information:

1. For the Work:

Project Title, including SBC project number, institutional location, and work name:	

2. For the Data Binder:

Cross out that which does not apply.	Operating & Maintenance Data Binder Project Data Binder

1.03 RECIPIENT SIGNATURE

A. By signature below, recipient acknowledges receipt of the Data Binder identified above, but does not certify the completeness or correctness of the Data Binder.

Recipient Signature:	
Please legibly indicate recipient's name and title or affiliation with Owner:	

END OF SECTION

SECTION 01 78 88
REPORT OF SUBCONTRACTORS AND SUPPLIERS

Project	SBC Project Number	Page
		of

Use first entry on first page for General Contractor

Work performed or Material Supplied, and Dollar Value	Firm name and address	Principal Contact and Phone	If a Minority-Owned Business, classification and certifying agency. If not, "NO".

SECTION 01 79 21
DEMONSTRATION and TRAINING

PART 1 - GENERAL: not used

PART 2 - PRODUCTS: not used

PART 3 - EXECUTION

3.01 Equipment Start-up / Commissioning

A. Conduct demonstration and instruction as soon as practicable upon installations, and prior to Substantial Completion inspection. Substantial Completion shall not be certified, nor shall Owner be required to assume responsibility for operating, maintaining, or insuring system, prior to complete demonstration and instruction.

B. Demonstrate operation of newly provided equipment and systems to Designer and to Owner's representative. Instruct Owner's personnel in operation, adjustment, and maintenance of equipment and systems, using the operating and maintenance data as the basis of instruction.

C. Make lists of persons witnessing equipment and systems demonstration, and persons receiving operating instruction, using a format similar to the form included in Section 01 79 25 with project, subject, trainer, session information, and attendees identified. Include copy of lists in the Operating and Maintenance Data Binders.

END OF SECTION

SECTION 01 79 25
DEMONSTRATION AND TRAINING VERIFICATION

PART 1 – GENERAL

1.01 Use a copy of this page as a planning form for demonstrations and training. Fill in the basic identifying information below:

SBC Project Number: _____

Institution/Location: _____

Project Name: _____

Required date of Substantial Completion

Owner's Facility Coordinator: _____ Phone: _____

Owner's Maintenance Contact: _____ Phone: _____

Contractor Contact: _____ Phone: _____

1.02 If a list of required demonstrations and training has been specified in Division 1, use that list as a starting point, review the project manual for other specifications that require training of the Owner's operators, and complete the list below. Check the box on left if Demonstration and Training is required on the standard listed subjects; add subjects as identified by review of the specifications and check the box to the left of each; and, schedule and indicate an target date for each. If the number of training subjects exceeds the available space provided here, replace or continue the list on a similarly formatted separate page. Submit the list with the initial Progress Schedule, and update as necessary during the Work to ensure that advance notice of the demonstration and training schedule is acceptable to the Designer.

	Spec Reference	Subject	Target Date	Actual Date
		Accessibility		
		Boiler		
		Chiller		
		Controls		
		Data Transmission		
		Electrical		
		Elevator / Conveying		
		Fire Alarm		
		Irrigation		
		Mechanical		
		Plumbing		
		Telecommunications		

PART 2 – PRODUCTS: not used.

PART 3 – EXECUTION

3.01 For each session conducted, use this page as a **Training Verification Report**.

A. Fill in the information below prior to the session ("End Time" may be filled in after):

SBC Project Number: _____

Institution/Location: _____

Project Name: _____

Subject Equipment / System:	
Spec Reference	

Demonstration and Training (by whom, where, when)	Trainer Name:	Company:		Phone:
	Place:	Date:	Start Time:	End Time:

B. Minimum Agenda Requirements:

☐ System Walk-through ☐ Operation ☐ Trouble-shooting ☐ Maintenance ☐ Safety

C. Attendance: Each person receiving the demonstration and training shall sign in below, or on a similarly formatted continuation page:

Initials	Legibly print your name	Unit and title or function

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide rough carpentry work as shown and specified. Work includes:

1. Roof curb openings blocking and nailers.
2. Concealed blocking for support of accessories, equipment, specialty items, cabinets, fixtures, trim and facing materials. Provide where necessary whether indicated or not.
3. Plywood sheathing.
4. Preservative treatment.
5. Rough hardware and accessory materials.

1.02 RELATED SECTIONS

A. Exterior Sheathing Board: Section 09 21 16.

1.03 REFERENCES

A. Standards

1. American Plywood Association (APA): Grades and Standards
   a. APA Plywood Design Specification, Form No. Y510T.
   b. APA Engineered Wood Construction Guide, Form No. E30R.
2. American Wood Preservers Association (AWPA): Treatment Standards.
   a. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties Pressure Treatment.
   b. AWPA C9 - Plywood Pressure Treatment.
3. PS - U.S. Product Standard: Softwood Lumber and Plywood Standards
   a. PS-1 - Construction and Industrial Plywood.
   b. PS-20 - American Softwood Lumber Standard.

1.04 SUBMITTALS

A. Shop Drawings: Submit shop drawings indicating framing connection details, fastener connections and dimensions.

B. Preservative Treated Wood: Submit certification by treating plant stating chemical and process used and conformance with applicable standards.

1.05 QUALITY ASSURANCE

A. Softwood Lumber: Grading rules and wood species shall conform with the

voluntary Product Standards PS 20 including grading rules of the following associations, as applicable:

1. Southern Pine: Standard Grading Rules for Southern Pine Lumber, published by Southern Pine Inspection Bureau (SPIB).
2. Douglas Fir, Western Larch and Hemlock: Western Lumber Grading Rules, published by Western Wood Products Association (WWPA), or Standard Grading and Dressing Rules for West Coast Lumber Inspection Bureau (WCLIB).
3. Western Spruce, Pine and Fir: Western Spruce-Pine-Fir Association (WSPFA) and current Canadian Grading Rules by National Grades Association, Canada.

B. Softwood Plywood: Grading rules and wood species shall conform with Product Standard PS 1.

C. Grade Marks

1. General: Identify all lumber and plywood by official grade mark.
2. Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping, or combination designation, rules under which graded, where applicable and condition of seasoning at time of manufacture.
3. Softwood Plywood: Appropriate grade trademark of the American Plywood Association.
   a. Type, grade, class and identification index.
   b. Inspection and testing agency mark.

1.06 STORAGE AND HANDLING

A. Store off the ground.

B. Protect from direct contact with the weather.

C. Provide proper ventilation.

D. Adhesives

1. Do not store adhesives with materials that have a high capacity to absorb VOC emissions (i.e., materials which are woven, fibrous or porous in nature, such as acoustical ceilings, carpets, textiles, etc.).
2. Do not store adhesives in occupied spaces.

1.07 JOB CONDITIONS

A. Time delivery and installation of carpentry work to avoid delaying trades whose work is dependent on, or affected by, the carpentry work and to comply with protection and storage requirements.

B. Installer must examine the surfaces and supporting structure and the conditions

under which the carpentry work is to be installed, and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

C. Correlate location of furring, nailers, blocking, grounds and similar supports so that attached work will comply with design requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Dimension Lumber - General

1. Nominal sizes are indicated, except as shown by detailed dimensions. Provide lumber complying with lumber producer's inspection agency grading rules certified as conforming to the "National Grading Rule for Dimension Lumber," by Board of Review of the American Lumber Standards Committee (ALCS), established under Section 10 of PS 20.
2. Dress dimension lumber S4S unless otherwise shown or scheduled.
3. Provide seasoned dimension lumber with 19% maximum moisture content at time of dressing and complying with the dry size requirements of PS 20. Mark lumber "S-DRY".

B. Light Framing Lumber: Where framing lumber from 2" through 4" thick, and 4" or less wide is indicated, provide lumber complying with the specified requirements for dimension lumber and with the following grading, unless otherwise indicated:

1. Provide "Construction" grade light framing and mark "CONST".
2. Where stud framing is shown, provide "Stud" grade lumber and mark "STUD".
3. Specie: Any commercial softwood.

C. Miscellaneous Lumber

1. Provide wood for support or attachment of other work such as cant strips, nailers, blocking, furring, grounds, bucks, stripping and similar members. Provide lumber of the sizes shown or specified, worked to shapes shown and as follows:
   a. Specie: Any commercial softwood, construction grade.

E. Plywood: Provide exterior grade plywood for exterior use and interior type with exterior glue for interior use.

1. Concealed Use
   a. Exterior: APA-CD-EXT.
   b. Interior: APA-CD-EXPOSURE I, with exterior glue.
2. Exposed Interior Use - Painted Finish: APA MEDIUM DENSITY OVERLAY (MDO).

3. Backing Panels: APA CD PLUGGED INT with exterior glue, square edge.

2.02 PRESERVATIVE WOOD TREATMENT

A. Pressure treat all wood lumber members in contact with masonry or concrete with water-borne preservatives in accordance with AWPA C2 for lumber to comply with AWPA Standard T-1 and U-1.

1. Provide ACQ or CBA-A; CHEMICAL SPECIALTIES, INC. Preserve; OSMOSE NatureWood; WOLMANIZED Natural Select.
2. Retention
   a. ACQ: Minimum 0.25 lbs./cu. ft.
   b. CBA-A: Minimum: 0.20 lbs./cu. ft.

B. Mark each piece of treated lumber with AWPA Quality Mark designation denoting conformance to the appropriate specification.

C. After treatment, kiln-dry lumber and plywood to maximum 19% moisture content. Inspect each piece of lumber after drying and discard damaged or defective pieces.

D. Complete fabrication of treated items before treatment, where possible. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment.

2.03 ROUGH HARDWARE

A. General: Provide all necessary spikes, screws, nails, bolts and other hardware for satisfactory erection of work. Except where noted to be stainless steel, provide hot-dipped galvanized finish for hardware exposed to exterior, located in toilet rooms, in contact with treated wood or in contact with roofing or flashing.

1. Nails: Common wire nails, except where noted otherwise on drawings; sizes as noted or specified herein.
2. Attachment to Concrete or Masonry: Metal expansion type shields or inserts; sizes as required to accommodate applied fastener; spacing as indicated on drawings.
   a. "DH" or "Ankr-Tight" by WEJ-IT or equal by RED HEAD or HILTI.
   b. Sleeve type for masonry.
   c. Wedge type for concrete.
3. Attachment to Steel Studs: Self tapping screws of sufficient length and strength to perform the functions for which they are used.
4. Roof Construction
   a. Wood-to-Wood Attachment: 300 Series stainless steel, flat head.
      1) Plywood to Nailers: Minimum #8 x 1-3/4".
   b. Wood-to-Metal Deck Attachment: Hot dip galvanized in accordance with ASTM A153; machine bolts, locknuts and washers; minimum 3/8" diameter.

B. Provide plates, anchors, hangers and other miscellaneous steel and iron shapes as required for framing and supporting woodwork and for anchoring or securing

woodwork to concrete or wood structures.

2.05 MISCELLANEOUS ITEMS

A. Adhesive - For field gluing panels to framing or to other wood panels: Low-VOC, FS MMM-A-125C, Type II, water- and mold-resistant. Use ASTM D3110, dry-use type for laminated and finger-jointed members, certified in accordance with ASTM C557 and complying with required VOC regulations.

PART 3 EXECUTION

3.01 INSTALLATION

A. General

1. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate the work with a minimum of joints or the optimum jointing arrangement.
2. Fit carpentry work to other work. Scribe and cope as required for accurate fit.
3. Set wood framing accurately to required lines and levels.
4. Cut, join and tightly fit framing around other work.
5. Anchor and nail as indicated, or if not indicated to comply with the Authorities having jurisdiction (local Codes).
6. Fasteners
   a. Use common wire nails, except as otherwise shown or specified herein.
   b. Use finishing nails for exposed work.
   c. Do not wax or lubricate fasteners that depend on friction for holding power.
   d. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials.
   e. Make tight connections between members.
   f. Install fasteners without splitting of wood; predrill as required. Do not drive threaded friction type fasteners; turn into place.
   g. Tighten bolts and lag screws at installation and retighten as required for tight connections prior to closing in or at completion of work.
   h. Countersink nail heads on exposed carpentry work and fill holes.
   i. Provide washers under bolt heads and nuts in contact with wood.
7. Nail plywood to comply with the recommendations of the American Plywood Association.

B. Wood Grounds, Nailers and Blocking

1. Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached or screeded.
2. Coordinate location with other work; refer to shop drawings of such work, if any.

3. Attach to surfaces securely with anchor bolts or other attachment devices as shown, and as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry as work progresses, cutting to fit masonry unit size involved. Anchor to formwork before concrete placement.
4. Provide grounds of dressed, key-bevelled lumber not less than 1-1/2" wide and of the thickness required to bring face of ground to exact thickness of finish material involved.
   Remove temporary grounds when no longer required. Where indicated as permanent grounds, provide treated lumber.
5. Anchor plates, blocking, nailers, etc. to masonry and concrete masonry units (units with cores grouted solid) with minimum 1/2" diameter fasteners spaced at 4' o.c., unless otherwise indicated. Situations requiring special bolting shall be with size and spacing of bolts as required.

3.02 MISCELLANEOUS INSTALLATIONS

A. Backing Panels: Provide plywood backing panels for electrical and telephone equipment where indicated.

1. Provide fire-retardant material at interior locations.
2. Provide preservative treated material at exterior locations.

3.03 WOOD TREATMENT

A. Preservative Treated Wood Products: Provide pressure treatment for all lumber and plywood as specified hereinbefore.

B. Field Cuts: Apply 2 brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.

3.04 CLEANING

A. Clean up debris and cuttings daily. Remove and dispose of excess materials and debris created by carpentry.

B. Maintain the building and site free of accumulations of cutting and waste materials in a neat orderly condition acceptable to the Architect.

3.05 WASTE MANAGEMENT

A. Do not burn scraps of treated wood. Do not mix treated wood scraps with untreated wood. Hazardous wastes shall be separated, stored, and disposed of according to local regulations.

END OF SECTION

SECTION 06 61 17

SOLID SURFACE COUNTERTOPS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work includes solid surfacing countertops with integral sink bowls and splashes as indicated on the drawings.

1.02 RELATED SECTIONS

A. Rough Carpentry: Section 06 10 00.

1.03 SUBMITTALS

A. Submit shop drawings for countertops.

1. Provide large scale details.
2. Indicate methods of fabrication, edging, location and construction of joints.

B. AWI Quality Standards: A photo-copy of the applicable portions of the AWI publication "Architectural Woodwork Quality Standards", latest edition, shall be submitted with each set of shop drawings.

1. Each copy must be marked to clearly show all details, specifications and finishes proposed for this work.

C. Submit samples of the solid surface counter top.

D. Manufacturer's product data describing solid surface counter top material.

1.04 QUALITY ASSURANCE

A. Fabricator qualifications: A firm specializing in the fabrication of solid surface items with a minimum of 5 years experience and a satisfactory record of performance on projects of comparable size and quality. Fabricator shall be acceptable to the Architect.

B. Installation: Performed only by skilled finish carpenters with a minimum of 3 years experience in installing custom solid surface items similar to that required for this project.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect materials and items during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver materials and items until concrete, masonry, painting, grinding and other similar wet work has been completed and is thoroughly dry.

C. Store materials in dry, well-ventilated spaces with constant minimum temperature of 60 degrees F., and maximum relative humidity of 55%.

1.06 PROJECT CONDITIONS

A. Provide and maintain a constant temperature and humidity before, during and after installation as required to maintain optimum moisture content of installed materials.

B. Obtain measurements and verify dimensions and details before proceeding with architectural woodwork.

PART 2 PRODUCTS

2.01 BASIC MATERIALS AND FABRICATION METHODS

A. Solid Surface Material

1. Material: Homogeneous filled acrylic meeting ANSI Z124.3 and .6, Type Six, and Fed. Spec. WW-P-541E/GEN.
2. Basic Minimum Material Properties
   a. Hardness: 52-60 Barcol ASTM D785.
   b. Specific Gravity: 1.53-11.8 g/cc ASTM D972A
   c. Tensile Strength: 4000 ASTM D638.
   d. Flexural Strength: 7000 ASTM D790.
   e. Izod Impact: .24 ASTM D256.
   f. Thermal Expansion: .000018-.0000042 in./in./^{o}C ASTM D696.
3. Thickness: ¾".
4. Colors: As selected by Architect.

B. Manufacturer

1. Basis of Design: Drawings and specifications are based on products fabricated from Corian by DuPONT, Staron by SAMSUNG/CHEIL INDUSTRIES or equal.
2. Other Manufacturers: Products by other manufacturers will be considered during bidding. Products must meet the performance requirements specified, match colors selected as determined by the Architect, conform to details indicated on the drawings and be approved by Architect.

B. Fabrication

1. Fabricate to dimensions, profiles and details indicated with openings and mortises precut, where possible to receive fixtures, accessories and other similar items of work.
2. Ease edges as indicated on the drawings. Fabricate edges with solid surface material, except as otherwise indicated.

3. Complete fabrication and other work before shipment to site to the greatest extent practicable. Disassemble components where necessary for fitting at site. Provide ample allowance for scribing, trimming and fitting.
4. Secure bowls and splashes or similar items to countertop per manufacturer's installation method; seamed undermount "S".

C. Measurements: Prior to fabrication of items required to be fitted to other construction, obtain field measurements and verify dimensions and Shop Drawing details as required for accurate fit.

2.02 MISCELLANEOUS MATERIALS

A. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, nonporous joints, with chemical bond.

B. Screws: Select material, type, size and finish required for each use. Comply with FS FF-S-111.

PART 3 EXECUTION

3.01 PREPARATION

A. Condition materials, items and products to average prevailing humidity conditions in installation areas before installing.

B. Install blocking and anchoring devices built into substrates for anchorage of solid surface fabrications.

C. Deliver inserts and anchoring devices to be built into substrates well in advance of time substrates are to be built.

3.02 INSTALLATION

A. General

1. Install items plumb, level, true and straight with no distortion.
2. Shim as required using concealed shims.
3. Install to a tolerance of 1/8" in 8'-0" for plumb and level, with no offset in flushness of adjoining surfaces.

B. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

C. Install countertops level, true to alignment, accurately fit to wall conditions and securely fastened to base units and other support systems as indicated.

3.03 CLEANING AND PROTECTION

A. Repair damaged and defective items to eliminate functional and visual defects.

Where not possible to repair properly, replace items as directed by the Architect.

B. Protect installed work during remaining construction operations.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide metal doors and frames as indicated and specified. Work includes, but is not limited to:

1. Standard steel doors and frames.
2. Fire rated steel doors and frames.

1.02 RELATED SECTIONS

A. Hardware: Section 08 71 10.

B. Wood Doors: Section 08 14 00

1.03 QUALITY ASSURANCE

A. Provide metal doors and frames fabricated by one manufacturer to ensure uniformity in appearance and construction.

B. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

1. ANSI: American National Standards Institute.
2. ASTM: American Society for Testing and Materials.
3. SDI: Steel Door Institute.
4. DHI: Door and Hardware Institute.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of standard metal door and frame required.

B. Submit shop drawings. Identify doors and frames in accordance with drawing door schedule. Indicate:

1. Elevations of each door design.
2. Hardware locations, installation methods and hardware reinforcements.
3. Dimensions and shapes of materials, anchorage and fastening methods.
4. Door frame types, profile of molding and details.
5. Wall opening construction and connection to other work.

C. Product Data. Provide single source supplier for the Work of this Section.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver metal doors and frames cartoned or crated for protection during transit and job delivery. Provide sealed wrapping for factory.

B. Store doors and frames inside the building in a dry, well-ventilated area. Protect from damage, wetting and deterioration in accordance with manufacturer's recommendations.

1.06 LABEL DOOR REQUIREMENTS

A. Comply with the label requirements of NFPA and applicable local codes. Fabricate doors and frames in accordance with requirements of NFPA Standard No. 80 and UL Standard for Safety No. 10B for the class of door opening shown or scheduled.

1. Provide UL labels permanently fastened on each door and frame which is within the size limitations established by NFPA and UL for labeling.
2. Provide anchors for UL labeled frames required by the authority having jurisdiction.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: STEELCRAFT MFG. CO; AMWELD BUILDING PRODUCTS DIV.; CECO CORP.; PIONEER INDUSTRIES; REPUBLIC BUILDERS PRODUCTS CORP.; FENESTRA; CURRIES.

2.02 MATERIALS AND COMPONENTS

A. Standard metal doors and frames: Comply with SDI 100 material and fabrication recommendations and as specified.

B. Standard Metal Doors

1. Provide flush seamless type doors with seamless faces and edges, 1-3/4" thick, internally reinforced. Top and bottom closed flush.
   a. Provide glass lites where indicated.
2. Exterior Doors: Provide Grade III (extra heavy duty), Model 2 (seamless design). Fabricated from ASTM A526, 16 gage, commercial quality stretcher level, galvanized steel face sheets with ASTM A525 G60 or A60 zinc coating, mill phosphatized, 1-1/2 lb. density polyurethane insulated core U-factor 0.09, tops and bottoms closed with flush galvanized steel caps.
3. Interior Doors: Provide Grade II (heavy duty), Model 2 (seamless design). Fabricated from ASTM A366, 18 gage, commercial quality, stretcher level, cold-rolled steel face sheets with a Kraft resin impregnated honeycomb or polystyrene slab core bonded to door face sheets with thermal adhesive.
4. Hardware Reinforcements: Meet or exceed SDI 107 requirements.

5. Edge Profile: 1/8" bevel in 2" core on hinge and lock edges.
6. Astragals for pairs of doors: Manufacturer's standard for labeled and non-labeled openings. Factory prepare for hardware as scheduled in Section 08 71 10. Mount astragal to overlap on key side of doors.

C. Standard Metal Frames

1. Interior Frames: Fabricated from ASTM A366, commercial quality cold rolled steel, 16 gage. Set-up and welded type, all miters clean cut, reinforced, fully seam welded with exposed welds ground smooth.
2. Exterior Frames: Fabricated from ASTM A526, 16 gage commercial quality galvanized steel with ASTM A525 G60 or A60 zinc coating, mill phosphatized. Set-up and welded type, all miters clean cut, reinforced, fully seam welded with exposed welds ground smooth.
3. Profile: Double rabbet, jamb face and depth as indicated.
4. Hardware Reinforcements: Meet SDI 107 requirements.
5. Transoms and Sidelites: Provide for loose glazing stops to be secured with countersunk screws.
    a. Provide ¾" stops for sidelites and transoms where the individual glass areas for fire rated openings exceeds the allowable area for 5/8" stops.

D. Fire Doors and Frames

1. Comply with Label Door Requirements specified herein before.
2. Agency: Underwriter's Laboratories.
3. Classification: As indicated.
4. Conform to requirements of Standard Metal Door and Frames specified herein.

E. Frames for Glazed Openings (Borrowed Light): Minimum 18 gage with integral stop, profile and size per drawings. Provide loose metal glazing stops of same gage as frame.

1. Provide for loose stops to be secured with countersunk screws.

    a. Provide ¾" stops for sidelites and transoms where the individual glass areas for fire rated openings exceeds the allowable area for 5/8" stops.
2. Verify thickness of glazing material before fabrication and glazing clearances required.
3. Frame components to be fully welded, except required loose glazing stops, at connections with exposed welds ground flush and smooth with frame surfaces.
4. Fire Rated Frames: Provide for ratings indicated in accordance with paragraph 2.02D herein.

2.03 FABRICATION

A. Reinforce and prepare doors and frames to receive hardware. Fit for hardware at

the factory to template. Do all necessary cutting, drilling and tapping. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.

B. Provide surfaces smooth and free from defects, warp or buckle with arrises straight and sharp.

C. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for surface applied finish hardware may be done at project site.

D. Locate finish hardware as shown on final shop drawings or, if not shown, in accordance with DHI "Recommended Locations for Builder's Hardware."

E. Door and Frame Fabrication

1. Provide cutouts for mortised hardware, accurately located and made to fit hardware.
2. Punch frames for door silencers, three on strike side for single doors. Factory install plastic caps. Stick-on silencers are not acceptable.
3. Exterior and Interior Frames: Provide minimum three anchors of suitable design for each jamb. Provide galvanized anchors for units built into exterior walls.
4. Floor Anchors: Provide floor clip on bottom of each jamb. Provide angle spreaders at bottom of each set-up frame.
5. Conduit for Door Frames
   a. Shop install ¾" electrical conduit within hollow metal door frame where indicated or where required for electric strikes or similar type electrical frame mounted hardware.
   b. Route conduit in frame in the most direct and simple manner so that pulling wire can be performed with a minimum of bends and obstructions. Route conduit to avoid damage to conduit during field installation of frame and operations to grout frame solid.
   c. Connect conduit to electrical junction box or conduit embedded in building structure by means of a threaded coupling. The termination point of the conduit within the frame shall be free and have enough slack to make final connection to embedded device.

F. Shop Painting

1. Clean, bonderize or chemically treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
2. Clean steel surfaces of mill scale, rust oil, grease, dirt and other foreign materials before application of paint. Sand free of imperfections.
3. Apply one baked-on shop coat of rust-inhibitive prime paint in accordance with ASNI A224.1. Provide a smooth, uniformly finished surface ready to receive finish paint.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, rough openings and installation conditions. Do not proceed with metal door and frame work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Before installation, apply one coat of bituminous protective paint over shop primer to all concealed frame surfaces built into exterior openings.

3.03 INSTALLATION

A. Install metal doors and frames in accordance with manufacturer's installation instructions and final shop drawings.

B. Placing Frames

1. General
   a. Comply with ANSI A250.11 (Revision of SDI 105) "Recommended Erection Instructions for Steel Frames."
   b. Erect frames in proper position to receive partition work before construction of enclosing walls. Set frames accurately in position, plumbed, aligned with heads level and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders.
   c. Grout frames as indicated on the drawings. Coordinate grout placement with adjoining materials and door hardware.
2. At Masonry Construction: Locate wall anchors at 16" on center. Building-in of anchors and grouting of frames is specified in Section 04 00 00.
3. Fire-Rated Frames: In accordance with NFPA standard No. 80.
4. Metal Stud Partitions: Install at least 3 wall anchors per jamb at hinge and strike levels. Attach wall anchors to studs with tapping screws.

C. Door Installation

1. Install doors plumb and in true alignment in prepared openings. Fit metal doors accurately in frames, within clearances specified in ANSI/SDI A250.8 (SDI100).
2. Install fire-rated doors with clearances as specified in NFPA Standard No. 80.

D. Immediately after erection, sand smooth rusted or damaged areas of door and frame coat and apply touch-up prime coat of compatible air-drying primer.

3.04 FIELD QUALITY CONTROL

A. Final Adjustment: Provide final adjustment as follows:

1. Door Contact with Silencers: Doors shall strike a minimum of two (2) silencers without binding lock or latch bolts in strike plate.
2. Head, Strike and Hinge Jamb Clearance: 1/8".
3. Meeting Edge Clearance, Pairs of Doors: +1/16"
4. Bolts and Screws: Leave tight and firmly seated.

END OF SECTION

SECTION 08 14 00

WOOD DOORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide the following types of wood doors:

1. Solid core
2. Fire rated

1.02 RELATED SECTIONS

A. Installation: Section 06 20 00.

B. Hollow Metal Door Frames: Section 08 11 13.

C. Door Hardware Section 08 71 00.

1.03 QUALITY ASSURANCE

A. Provide wood doors fabricated by one manufacturer to ensure uniformity in appearance and construction.

B. Reference Standards

1. Underwriters' Laboratories - UL 10B (neutral pressure) and UL 10C (positive pressure) - Fire Tests of Door Assemblies
2. Window and Door Manufacturers Association (WDMA): WDMA IS 1A-04.
3. Architectural Wood Work Institute: AWI "Quality Standards, Guide Specification" requirements.
4. NFPA 80 - Fire Doors and Windows
5. NFPA 252 - Standard Methods of Fire Tests for Door Assemblies

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of wood door required.

1. Include details of core and edge construction.
2. Include certification indicating compliance with specification requirements.

B. Submit Shop Drawings

1. Indicate location and size of each door, elevation of each kind of door,

details of construction, location and extent of hardware blocking and other pertinent data.

2. Identify doors in accordance with drawing door schedule.

C. Submit sample corner section, 12" square, showing required veneer and edge construction.

D. Finish Samples

1. Factory Finished Doors: Submit three (3) flitch samples of each species of face veneer with factory applied stain and finish as specified and indicated illustrating expected range of color and grain variation.

2 Field Finished Doors: Submit three (3) flitch samples of each species of face veneer as specified and indicated illustrating expected range of grain variation. Samples will be used to select and approve field stain color as specified in Section 09 91 00.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store and protect doors in accordance with manufacturer's recommendations and WDMA.

B. Following are general guidelines. For more specific information refer to WDMA's Appendix Section “Care and Installation at Job Site.”

1. Deliver doors in manufacturer's original unopened protective packaging or wrapper.
   a. Store doors flat and off the floor on a level surface in a dry, well-ventilated building. Do not store on edge. Protect doors from dirt, water and abuse.
   b. Do not subject interior doors to extremes in either heat or humidity. HVAC systems should be operational and balanced, providing a temperature range of 50 to 90 degrees Fahrenheit and 30% to 50% relative humidity.
   c. When handling doors, always lift and carry. Do not drag across other doors or surfaces. Handle with clean hands or gloves.
   d. Each door will be marked on top rail with opening number.

1.06 LABEL DOOR REQUIREMENTS

A. Fire Ratings Compliance: Comply with the label requirements of NFPA and applicable local codes. Fabricate doors and frames in accordance with requirements of NFPA Standard No. 80 and U.L. Standards as follows:

1. Neutral Pressure Testing - UBC 43-2 or 7-2-94; or UL10B.
2. Positive Pressure Testing UBC 7-2-97 or UL10C

B. Ratings Certifications

1. Provide U.L. labels permanently fastened on each door that is within the

size limitations established by NFPA and U.L. for labeling.

2. Provide anchors for U.L. labeled frames required by the authority having jurisdiction.

1.07 WARRANTY

A. Submit written warranty on door manufacturer's standard form, signed by manufacturer, installer and Contractor, agreeing to repair or replace defective doors which have been warped (bowed, cup or twist), or which show telegraphing of core construction below face veneer, or delamination, or do not conform to tolerance limitations of WDMA I.S.1A-04 or other defects in materials and workmanship for the life of the installation for interior doors.

B. Warranty shall also include furnishing, installing and finishing new doors meeting specification requirements that may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Interior Flush Doors Solid Core: Meet or exceed WDMA I.S.1A Industry Standard for Wood Flush Doors requirements and as specified.

1. Interior Flush Doors Solid Core – Non-Rated and 20 Minute Rated Fire Doors: Provide one of the following cores with hardwood veneers:
   a. Particleboard Core (PC-5) to comply with ANSI Standard A208.1 LD-2, with screw holding power of 125 lbs., modulus of rupture of 800 psi, modulus of elasticity of 150,000 psi and density of 30-35 lbs. per cubic foot. Formaldehyde free.
   b. Stave Lumber Core (SLC-5) may be a combination of solid, low-density hardwood lumber blocks or strips not more than 2-1/2" wide of one species of wood between 6% to 9% moisture content. Joints to be tight and staggered in adjacent rows. Lumber density is 25 to 27 lbs. per cubic foot. Formaldehyde free.
   c. Structural Composite Lumber Core (SCLC-5) is an engineered hardwood composite sometimes referred to as LSL (Laminated Strand Lumber). The material complies with WDMA minimum performance levels for interior applications with screw holding power of 540 lbs., modulus of rupture of 6,500 psi, modulus of elasticity of 1,300,000 psi and density of 38 lbs per cubic foot. Formaldehyde free.
2. Interior Flush Fire Doors – Above 20 Minute Rated: FD solid core with hardwood face veneer.
   a. Rating as indicated on drawings.
   b. Provide one of the above cores or the following as required to maintain fire rating:
      1) Non-combustible mineral composite material that is necessary for higher hourly ratings per manufacturer’s approval.

B. Moldings: Trim louver and glass openings with recessed bead type wood moldings, species matching door face veneer species. Profile as selected by the Architect from manufacturer's standard profiles.

2.02 FABRICATION

A. Flush Doors: Fabricate doors in accordance with WDMA "Premium Grade" requirements for transparent stained finish. Formaldehyde free.

1. Core Construction: Bond stiles and rails to core and sand entire unit prior to assembly of face veneers.
2. Number of Plies: 5.
3. Face Veneers: Minimum 1/50" thick before sanding, plain sliced, Grade A red oak hardwood.
4. Door Thickness: 1-3/4" thick.
5. Adhesive: Type I, waterproof.
6. Edge Strips: Stile edges hardwood species matching face veneer; bonded to core; 1-1/8" minimum width after trimming. Top and bottom edges hardwood of mill option.
7. Veneer Matching: Provide veneers book matched for color and grain.
8. Hardware: Factory machine for mortise hardware using template provided by hardware manufacturer.
9. Reinforcement: Reinforce doors to receive hardware specified.
    a. Hinge Attachment: Stiles and rails to be continuously glue bonded to the core so that screw stress is transmitted directly to the core.
    b. Closure, Exit Device and Other Surface Mounted Hardware: Provide top rail 2-1/2" or more in width to hold closer fasteners and solid wood blocking for all other surface applied hardware.

B. Fire Rated Doors: Conform to "Flush Door" requirements specified above. Provide doors of U.L. classification indicated.

1. Reinforcement: Reinforce doors to receive hardware specified.
    a. Hinge Attachment: Triple ply stiles by MARSHFIELD. One half inch, high density inner stile by ALGOMA or equal by other listed manufacturers.
    b. Surface applied hardware that is located where screws cannot penetrate the above mentioned stiles or wood rails shall be through bolted.

D. Finish:

1. Comply with recommendations of WDMA for finish. Manufacturer to factory prep units for field stain. Color as selected by Architect.

E. Individually package doors at factory with manufacturer's standard packaging or wrapping for delivery to job site.

F. Manufacturer: MARSHFIELD DOOR SYSTEMS; EGGERS; ALGOMA; OSHKOSH; V T INDUSTRIES.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substances, rough openings and installation conditions. Do not proceed with wood door installation until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Verify metal frame dimensions and hardware mortises in metal frames with metal frame manufacturer.

3.03 INSTALLATION

A. Condition doors to average prevailing humidity in installation area before hanging.

B. Install doors in accordance with manufacturer's installation instructions. Job fit and prepare doors to receive hardware. Bevel 1/8" in 2" at strike edges for clearance in arc of swing. Seal cut surfaces, tops, bottoms and edges with sanding sealer after fitting and machining.

C. Hang doors straight, plumb and square securely anchored into position. Adjust doors to provide uniform clearance and to contact stops uniformly. Remove and replace doors that are warped, bowed or otherwise damaged and cannot be properly fit to the opening.

D. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA No. 80.

3.04 PROTECTION

A. Protect installed doors from soiling, staining and damage until final acceptance.

B. Repair or replace doors damaged beyond acceptable repair as directed by the Architect.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.01 SCOPE

A. Finish hardware for aluminum, hollow metal and wood doors. Included is:

1. Screws, bolts, and other fasteners required to install door hardware.
2. Special tools required to install and adjust door hardware.

1.02 RELATED SECTIONS

A. Alternate No. 1: Section 01 23 00.

B. Finish Carpentry (Hardware Installation): Section 06 10 00.

C. Hollow Metal Door Frames: Section 08 11 13.

D. Wood Doors: Section 08 14 00.

E. Aluminum Entrance Doors: Section 08 41 13.

1.03 QUALITY ASSURANCE

A. Supplier: A recognized building hardware supplier who has been furnishing hardware in the project's vicinity for not less than two years and who is or employs an Architectural Hardware Consultant (AHC), who will be available at no additional cost to the Owner during the course of construction.

B. Scheduling: Performed by an AHC member of Door and Hardware Institute (DHI).

1. The AHC shall be present at completion of the work; check the installation, make all minor adjustments required, and supervise required hardware replacements and report to the Architect on completeness of the installation.
2. Identify locksets and latchsets function by manufacturer's number on itemized schedule of hardware submitted for approval.

C. Reference Standards: Whenever the following abbreviations are used herein they shall refer to the corresponding standard:

1. American National Standards Institute (ANSI)
   a. ANSI 117.1: Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
   b. ANSI A156.1: Butts & Hinges - Grade 1.

c. ANSI A156.2: Locks & Lock Trim - Grade 1.
d. ANSI A156.3: Exit Devices - Grade 1.
e. ANSI A156.4: Door Controls, Closers - Grade 1.
f. ANSI A156.13: Mortise Locks & Latches - Grade 1.

2. Builders Hardware Manufacturers Association (BHMA)
   a. BHMA Product Standards: Latest Edition.
   b. BHMA Standard for Materials Finishes: Latest Edition.
3. Door and Hardware Institute (DHI)
   a. DHI Publication: Recommended Locations for Architectural Hardware.
   b. DHI Publication: Hardware for Labeled Fire Doors.
   c. DHI Publication: Supplement Hardware for Labeled Fire Doors.
4. ADA: Americans with Disabilities Act, Title III.

C. Codes and Regulations: All hardware listed or furnished shall meet requirements of Federal, State and Local codes having jurisdiction over this installation.

1. Any item furnished that does not meet code requirements, shall be removed and proper items substituted at no additional cost or expense to the Owner.

1.04 SUBMITTALS

A. Schedules: Submit detailed finish hardware schedule in accordance with Section 01 33 23. Schedule shall be complete and include product type, manufacturer's name and model number, and finish of every item required.

B. Product Data Sheets: Submit copies of manufacturer's catalog cut sheets for every item that is detailed in the finish hardware schedule in accordance with Section 01 33 23.

C. Samples: Submit one sample of each item of finish hardware included in your schedule for inspection and approval. Samples may later be used on project.

D. Templates: Furnish templates for fabrication of the following related work not included in this section: hollow metal doors and frames, aluminum doors and frames, wood doors, and any other related work areas.

E. Keying Schedule: Submit keying schedule for approval in accordance with DHI's Keying Systems and Nomenclature Handbook.

F. Operation Manuals: Furnish operation and maintenance manuals to owner.

G. Certification: Submit notarized certification indicating that hardware furnished for labeled doors and doors requiring physically handicapped access complies with requirements of governing authorities and applicable regulations.

1.05 DELIVERY, STORAGE AND HANDLING

A. Package each item of hardware and each lockset, complete with all necessary

screws, anchors, instruction and installation templates. Identify packages by indexing with corresponding item number of the Hardware Schedule.

B. Deliver packaged hardware items at proper time for installation. Provide secure locked storage for hardware. Control handling of items that are not immediately replaceable to prevent delays due to hardware loss.

C. Contractor and hardware supplier shall jointly inventory hardware when delivered to job site for agreement with the hardware schedule and promptly report errors or discrepancies to the Architect.

D. Store, handle and install hardware in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration.

1.06 PROJECT CONDITIONS

A. Examine detail drawings and provide fittings to details as required.

B. Provide all necessary material templates of physical hardware to required fabricators of doors, door frames and other work requiring factory preparation for hardware installation. Upon request, check shop drawings of such other work to confirm adequate provisions are made for proper installation of hardware.

C. Meet with Architect and Owner's personnel on request, to establish final keying requirements.

1.07 WARRANTY

A. Warranty

1. All hardware items, except for those listed below, shall have a written one year limited warranty against defects in workmanship and operation.
2. Manufacturers of hardware assume no responsibility or liability of items that are improperly handled, installed, or maintained.
3. The hardware items listed below shall carry the following standard warranties:
   a. Manual Door Closers: 10 year warranty
   b. Exit Devices: 3 year warranty
   c. Warranty Period for Locks: 7 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. To the greatest extent possible, furnish all finish hardware of a specific item from only one manufacturer. All numbers and symbols used in the preparation of the following schedule have been taken from the current catalogs of the following manufacturers. **See 2.03.A this section for Owner required cores.**

1. Butts: HAGER.
2. Locksets and Latchsets: BEST, SCHLAGE.
3. Trim: ROCKWOOD.
4. Stops and Holders: ROCKWOOD.
5. Closers: DORMA, LCN.
6. Thresholds, Gaskets, Sweeps and Automatic Door Bottoms: HAGER, NATIONAL GUARD.
7. Exit Devices: DORMA, VON DUPRIN.
8. Flush Bolts: ROCKWOOD
9. Overhead Door Stops: GLYNN-JOHNSON.

B. Other Manufacturers: Hardware of the same types, weight and function, approved by Architect, and as manufactured by the following manufacturers may be bid; except NO SUBSTITUTIONS unless pre-approved by the Owner on the following:

1. Butts: STANLEY, McKINNEY.
2. Locksets and Latchsets: CORBIN-RUSSWIN, SARGENT.
3. Trim: BROOKLINE, HAGER, IVES.
4. Stops and Holders: GLYNN JOHNSON, IVES, HAGER.
5. Closers: NORTON.
6. Thresholds, Gaskets, Sweeps and Automatic Door Bottoms: PEMKO, REESE.
7. Exit Devices: PRECISION.
8. Flush Bolts: BALDWIN, IVES.
9. Overhead Door Stops: RIXSON, ABH.

2.02 MATERIALS AND COMPONENTS

A. Criteria Schedule: The standard type, function, finish and quality set forth in the hardware schedule is as follows:

B. Locksets and Latchsets: SCHLAGE L Series, 03A (lever) design. 626 finish.

1. Mortise locksets shall have an anti-friction latchbolt. One piece latchbolts are unacceptable.
2. Mortise locksets shall have sectional lever trim of the design and type as listed in the schedule.
3. Provide inside lever handle secured in place by a dowel screw and outside lever handle (secure side) pinned to the spindle.

C. Exit Devices: VD 99 Series

1. All exit devices shall be of one manufacturer.
2. Exit devices shall be furnished non-handed and capable of direct field conversion for all available trim functions.
3. Exit devices shall be UL listed for Accident Hazard. Fire exit devices shall carry an A label for the following products and maximum dimensions listed below:
   a. Rim and Mortise Exit Devices:
      4'-0" x 8'-0" single doors

8'-0" x 8'-0" pairs of doors

b. Surface and Concealed Vertical Rod Exit Devices
   4'-0" x 10'-0" single doors
   8'-0" x 10'-0" pairs of doors

c. Wood Door Concealed Vertical Rod Exit Devices
   4'-0" x 9'-3" single doors
   8'-0" x 9'-3" pairs of doors

4. Design: Push through type touch pad design with a straight or horizontal motion to eliminate pinch points.
5. Latch bolt shall have a self-lubricating coating that reduces friction and wear. Plated latch bolts are unacceptable.
6. Surface and concealed vertical rod exit devices: Incorporate a latch retraction feature, which shall hold both the top and bottom latchbolts in the retracted position while the door is open. Pullman latches or bottom latchbolt retraction only are not acceptable.
7. Finish: 626 .

D. Butts: Standard weight, five-knuckle, wrought steel or bronze. Pins in non-ferrous butts to be stainless steel and plain steel in all ferrous hinges. Provide all pins of non-rising type with a hole through the plug to facilitate pin removal. Provide all hinges with Phillips head screws.

1. All hinges on outswinging exterior doors [and doors located in Natatorium] shall be bronze base metal. Interior hinges shall be steel base metal, unless otherwise indicated.
2. Provide non-removable pin (NRP) feature on exterior outswinging doors and where specified.
3. 626 finish.
4. Provide ball-bearing type hinges on all doors with closers.
5. Hinge Sizes: Unless otherwise listed in Hardware Sets, provide the following:
   a. Doors Up to 3'-0" Wide: 4-1/2"h x 4-1/2"w.
   b. Doors Over 3'-0" Wide: 5"h x 4-1/2"w.

E. Door Closers: LCN 4011/4111

1. All door closers shall be the product of one manufacturer.
2. Shell: Cast iron or cast aluminum.
3. Full rack-and-pinion type.
4. Closer piston and spring bores shall be minimum 1-1/2" in diameter. Closer with smaller bores are not acceptable.
5. Closers shall be controlled by two springs: a main spring and a booster spring. Door closers having only one spring shall not be acceptable.
6. Provide closers with multi size spring power adjustment within the following ranges:
   a. Exterior Doors: sizes 2 through 6.
   b. Interior Doors: sizes 1 through 4.
   c. Fire Doors: sizes 2 through 6.
7. Provide closers with two non-critical valves, hex-key-adjusted, to independently regulate sweep and latch speed. Closers shall have

backcheck cushioning and backcheck positioning controlled by a hex-key valve. All adjusting valves shall be zinc or brass, accessible from the front of the door closer. No plastic adjusting valves shall be permitted.

8. Closers shall be packaged with arms, shoes, and accessories for regular arm, top jamb, and parallel arm mounting installations.
9. Regular arm and top jamb mounted door closers shall have a non-hold-open shoe permitting a 15% (+/- 7-1/2%) power adjustment.
10. Finish: Shop paint; color as selected by Architect.
11. Additional Door Closer Clarifications
    a. Closer Delay: Provide closers such that the sweep period from a 70 degree open position to 3" from the latch will not take less than 3 seconds, per ADA 4.13.10.
    b. Door Opening Force: Provide interior doors with a maximum opening force of 5 LBF per ADA 4.13.11.

F. Wall Stops: ROCKWOOD 409. Provide wall mounted type on all doors. Where wall types are not applicable, provide overhead stops. Check at site for proper type after doors are hung and as approved by Architect. 626 or 630 finish.

G. Overhead Stops and Holders: GJ #1 Series

1. Provide channels and slide members manufactured from brass, bronze or stainless steel. No plastic slide members permitted.
2. End caps for channels shall be manufactured from steel. Plastic end caps are not acceptable.
3. Operation: Engage and release door automatically by roller cam action with provision for a control knob at the bottom of the channel to engage or disengage hold-open action.

H. Fasteners

1. Manufacture hardware to conform to published templates; generally prepared for machine screw installation.
2. Furnish screws for installation, with each hardware item. Provide Phillips flat head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match the hardware finish, or if exposed in surfaces of other work, to match the finish of such other work as closely as possible.
3. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard manufactured units of the type specified are available with concealed fasteners.

I. Kick Plate: 8" high by 1-1/2" less than width of door, 1" less than width of pair of doors; .050" thickness. 630 finish.

J. Thresholds: NATIONAL GUARD 513; aluminum, maximum 1/2" high, with stainless steel fasteners. Conform to ANSI 117.1 and ADA Requirements.

K. Weatherstripping: NATIONAL GUARD 110N; extruded aluminum with neoprene insert.

L. Automatic Door Bottom: Surface mounted, neoprene seal with extruded aluminum housing. NATIONAL GUARD 420.

M. Rubber Silencers: Furnish as required for hollow metal frames. 3 per each single door, 2 per each leaf of each pair of doors.

N. Sweeps: NATIONAL GUARD 198N. Aluminum retainer with neoprene sweep.

O. Flush Bolts: ROCKWOOD 555 (HM) 557 (wood); 12” rod length; 1-3/4” thick door and 1880 dust proof strike.

P. Coordinator: ROCKWOOD 1600 Series. Non-handed type; provide with matching filler to fill opening width. Field paint to match hollow metal door frame. Provide with mounting brackets.

Q. Roller Catch: ROCKWOOD 592; adjustable type; with strike.

R. Push Plate: ROCKWOOD 70E x 16; 6” x 16” x .050”; bevel edges and square corners. 630 finish.

S. Pull/Plate: ROCKWOOD 107 x 70C; 4” x 16” plate with 3/4” round x 8-3/4” pull. 630 finish.

2.03 KEYING

A. Match Owner's existing keying system. Provide Best Lock IC cores (no substitute).

B. Final keying requirements shall be determined by the owner or the owner's agent in a meeting with the hardware supplier for the project.

C. An Architectural Hardware Consultant shall be available to assist the owner in making final keying decisions for the project.

D. Allow for 150% expansion of the keying system for any future additions, and provide with capacity for the project and the expansion mentioned above.

E. Provide a construction masterkey system to be used during the construction phase of the project.

F. All grand master and master keys shall be sent directly to the owner, via registered mail.

G. Furnish the following number of keys:

1. Construction keys: 12 total.
2. Change keys: 3 per lock.
3. Grand master keys: 5 total.
4. Master keys: 10 total.

2.04 HARDWARE SETS

A. General

1. Quantities listed under each hardware set number are for each door or pair of doors.
2. This schedule is intended to indicate the general quality and type of hardware required for the particular opening listed, but such description or schedule shall not be construed to denote that no other items of hardware will be required for the project.

B. Hardware Sets

1. The hardware schedule is itemized at the end of this section.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mount hardware units at heights recommended by DHI "Recommended Locations for Builders Hardware".

B. Install hardware in strict compliance with manufacturer's instructions. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as required for proper installation and operation.

1. Install mortised items flush with surface of doors and frames.
2. Install locksets, exit devices, door closers, and trim after painting is completed.

C. Upon completion, properly tag and identify keys and deliver to the owner or the owner's agent.

D. Closers

1. Exterior Doors: Install on interior side.
2. Corridor Doors: Install on room side not visible from corridors, lobbies and other public spaces.

E. Door Stops: Install wall mounted type or overhead mounted type as required on swing doors to limit travel and avoid damage to trim or adjacent wall.

F. Thresholds: Install on all exterior doors; include even if not indicated on door schedule or hardware sets. Install in bed of sealant on both legs of threshold.

G. Weatherstripping: Install on head and jambs of all exterior hollow metal doors; include even if not indicated on door schedule or hardware sets.

H. Sweeps: Install on all exterior hollow metal doors; include even if not indicated on door schedule or hardware sets.

I. Kickplates: Install on push side of door centered horizontally and one inch from bottom of door. Install on both sides of door where scheduled.

3.02 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of each unit. Lubricate moving parts with type of lubricant recommended by manufacturer. Replace units that cannot be adjusted or lubricated to operate freely and smoothly.

1. Adjust door closers for proper and smooth operation. All barrier-free closers shall be adjusted to meet the required opening force criteria.

B. Make final adjustment cleaning and lubricating, just before occupancy. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Instruct Owner's designated personnel in proper adjustment and maintenance of hardware and hardware finishes during final adjustment of units.

3.03 HARDWARE SCHEDULE

A. The minimum standards for quality of material and fabrication of all components are outlined in 1.03 Quality Assurance and Part 2 Products.

B. The hardware schedule (prepared by the Architectural Hardware Consultant listed below) has determine the minimum grade level of quality of materials for all project specific conditions, locations, intended use and finish:

David Scott, AHC/CDT
McCarthy Jones and Woodard, LLC
650 Southgate Avenue
Nashville, TN 37203

SCHEDULE

Refer to Section 01 23 00 for Alternate No. 1; and coordinate with the drawings for the base bid and alternate scopes of work.

Manufacturers:

Hager:	(1)
Schlage:	(2)
LCN:	(3)
Von Duprin:	(4)
Best:	(5)

BASE BID

Set 1

Door 100.1, 100.6

Each to receive:

6 Hinges BB1191 4 ½ x 4 ½ NRP 26D	(1)
2 Rim Panics 99L-996L 03A 626	(4)
1 Hardware Mullion KR4954	(4)
3 Cylinders	(5)
2 Closers 4111 CUSH TBWMS AL	(3)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
2 Sets Weatherstrip 891V 36” x 84” AL	(1)
1 Threshold 520SN 72” AL	(1)
2 Door Bottoms 789SW 36” AL	(1)
1 Rain Drip 810S 76” AL	(1)

Set 2

Door 100.2, 100.5, 108.3

All hardware by door supplier

Set 3

Door 100.3, 100.4, 101.1, 108.2, 109.3, 109.4

Each to receive:

3 Hinges BB1191 4 ½ x 4 ½ NRP 26D	(1)
1 Rim Panic 99L-996L 03A 626	(4)
1 Cylinder	(5)
2 Closers 4111 CUSH TBWMS AL	(3)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Set Weatherstrip 891V 36” x 84” AL	(1)
1 Threshold 520SN 36” AL	(1)
1 Door Bottom 789SW 36” AL	(1)
1 Rain Drip 810S 40” AL	(1)

Set 4

Not Used

Set 5

Door 101.2

Each to receive:

6 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
2 Rim Panics 99L-996L 03A 626	(4)
1 Hardware Mullion KR4954	(4)
3 Cylinders	(5)
2 Closers 4111 TBWMS AL	(3)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
2 Wall Stops 236W 32D	(1)

Set 6

Door 102.1, 103.1

Each to receive:

3 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Push Plate 30S 4 x 16 32D	(1)
1 Pull Plate 36N 4 x 16 32D	(1)
1 Closer 4111 TBWMS AL	(3)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Wall Stop 236W 32D	(1)

Set 7

Door 104.1, 105.1

Each to receive:

3 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Classroom Lock L9070 03A 626	(2)
1 Cylinder	(5)
1 Closer 4111 TBWMS AL	(3)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Wall Stop 236W 32D	(1)

Set 8

Door 106.1

Each to receive:

6 Hinges BB1191 4 ½ x 4 ½ NRP 26D	(1)
1 Mortise Storeroom Lock L9080 03A 626	(2)
1 Cylinder	(5)
2 Flush Bolts 282D 26D	(1)

2 Closers 4111 CUSH TBWMS AL	(3)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
1 Set Weatherstrip 891V 72” x 84” AL	(1)
1 Threshold 541SN 72” AL	(1)
1 Rain Drip 810S 76” AL	(1)

Set 9

Door 107.1, 100A.2

Each to receive:

3 Hinges BB1191 4 ½ x 4 ½ NRP 26D	(1)
1 Mortise Storeroom Lock L9080 03A 626	(2)
1 Cylinder	(5)
1 Closer 4111 CUSH TBWMS AL	(3)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Set Weatherstrip 891V 36” x 84” AL	(1)
1 Threshold 541SN 36” AL	(1)
1 Rain Drip 810S 40” AL	(1)

Set 10

Door 108.1, 109.1, 109.2

Each to receive:

6 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Classroom Lock L9070 03A 626	(2)
1 Cylinder	(5)
2 Flush Bolts 282D 26D	(1)
2 Closers 4111 CUSH TBWMS AL	(3)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
2 Wall Stops 236W 32D	(1)

Set 11

Door 106.2 OMITTED

ALTERNATE No. 1

Set 12

Door 114.1, 115.1

Each to receive:

3 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Entry Lock L9050 03A 626	(2)
1 Cylinder	(5)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Wall Stop 236W 32D	(1)

Set 13

Door 118.1

Each to receive:

3 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Classroom Lock L9070 03A 626	(2)
1 Cylinder	(5)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Wall Stop 236W 32D	(1)

Set 14

Door 116.1, 117.1

Each to receive:

6 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Classroom Lock L9070 03A 626	(2)
1 Cylinder	(5)
1 Dummy L0172 03A 626	(2)
2 Flush Bolts 282D 26D	(1)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
2 Wall Stops 236W 32D	(1)

END OF SECTION

SECTION 08 81 00

GLASS GLAZING

PART 1 GENERAL

1.01 SCOPE

A. Work Included: Provide glass and glazing for all interior and exterior openings.

B. Work Not Included: Glass and glazing not provided under this Section are as follows:

1. Framed Mirrors: Section 10 28 13.

1.02 RELATED SECTIONS

A. Glazing in Aluminum Framing: Section 08 41 13.

1.03 QUALITY ASSURANCE

A. Glazing Installation Methods: Comply with Flat Glass Marketing Association (FGMA) "Glazing Manual".

B. Installation: Performed only by experienced glaziers.

C. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

1. ANSI: American National Standards Institute.
2. ASTM: American Society for Testing and Materials.
3. GANA: Glass Association of North America.
4. IGMA: Insulated Glass Manufacturers Alliance.

D. Safety Glass Standards: ANSI Z97.1.

1.03 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of glass, glazing sealants and accessories required.

B. Submit insulating and laminated glass manufacturer's certification indicating units meet or exceed specified requirements.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle glazing materials in accordance with manufacturer's recommendations to prevent damage and deterioration.

1.05 PROJECT CONDITIONS

A. Field verify measurements and conditions of installations.

B. Examine all details. Provide proper fitting for details indicated.

C. Do not perform work under adverse weather or job site conditions. Install liquid sealants when temperatures are within lower or middle third of temperature range recommendations by manufacturer.

D. Protect work from damage during and after installation until project acceptance.

1.06 WARRANTY

A. Insulating Glass: Submit manufacturer's written warranty that for ten years from date of substantial completion, a replacement will be provided (furnished and installed) for any unit which develops edge separation, thermal stress cracks, or other defects which materially obstruct vision through the glass or affect thermal and physical integrity of insulating glass units, except warranty shall not cover glass breakage from other than natural causes. Defective units shall be replaced at no additional cost to the Owner.

B. Coated Glass: Submit manufacturer's written warranty that for five (5) years from date of substantial completion, a replacement will be provided for defective units. Defects are defined as peeling, cracking or deterioration in coating due to normal conditions and not due to handling or installation contrary to glass manufacturer's published instructions. Defective units shall be replaced at no additional cost to the Owner.

C. Mirror: Submit manufacturer's five (5) year warranty against silver spoilage. A replacement will be provided for mirrors that develop visible defects. Defective units shall be replaced at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 GLASS

A. General: New, bearing manufacturer's label.

B. Acceptable Manufacturers and Fabricators: Specifications herein are based on glass and materials manufactured or fabricated by the following manufacturers. Not all firms listed manufacture or fabricate all the items specified herein. However, to ensure consistent quality of appearance and performance, provide each type or kind of glass or material from a single source. Manufacturers for specialty products are listed within the specification to establish a particular type, color, pattern, etc. Equal products by the manufacturers listed are acceptable providing they meet the type, color, pattern, etc. as approved by the Architect.

1. AGC FLAT GLASS NORTH AMERICA
2. VIRACON
3. PPG
4. GUARDIAN INDUSTRIES
5. INTERPANE
6. ACH FLOAT GLASS
7. OLDCASTLE GLASS

C. Type

1. Float or Plate
   a. General: Transparent window glass.
   b. Conformance: Type I, Class 1, Quality q3, conforming to ASTM C1036.
   c. Thickness: 1/4 inch.
   d. Color: Clear
2. Tempered
   a. General: Transparent safety glass.
   b. Conformance; Kind FT, Condition A, Type I, Class 1, , conforming to ASTM C1048.
   c. Thickness: 1/4 inch.
   d. Color: Clear
3. Insulating Glass - Type 1
   a. Type: Two thicknesses of tempered glass conforming to requirements stated hereinbefore.
   b. Color: Clear, both panes.
   c. Thickness: 1/4 inch each pane.
   d. Air Space: 1/2 inch.
   e. Unit Thickness: 1 inch.
   f. Thermal Conductance (U-Value): 0.56 maximum.

D. Fabrication

1. Tempered
   a. Provide treated glass strengthened to not less than 4 to 5 times annealed glass strength.
   b. Cut glass to required size before tempering. Comply with glass tempering recommendation.
2. Insulating Glass: Manufacturer's standard double pane glazed insulating glass construction, separated by a spacer, hermetically sealed with Class A sealant-type edge construction; dry air of glass filled air space with minus 20 degrees F., dew point.
   a. Fabricate insulating glass units meeting certification requirements of ASTM E774 as performed by IGCC for a Class A rating. Provide units IGCC labeled.
   b. Edge Construction: Twin primary seals of polyisobutylene; welded or soldered sealed corners, and filled with desiccant; and secondary seal outside of bar, bonded to both sheets of glass and bar, or hyposulfite, silicone or halogenate butyl elastomeric sealant.

c. Warranty: Provide manufacturer's standard ten year product warranty on maintained hermetic seal.

2.02 GLAZING MATERIALS AND ACCESSORIES

A. Glazing Sealants and Compounds

1. Comply with manufacturer's recommendations for selection of hardness. Select materials and variations or modifications for compatibility with surfaces contacted in the installation.
2. One part silicone rubber glazing sealant, complying with ASTM C920, Class A, non-sag. Provide acid type recommended by manufacturer; where one or more porous bond surfaces are contacted.
3. Preformed Butyl Rubber Glazing Sealant: Compound of polymerized butyl rubber and inert fillers, with or without polyisobutylene modification, solvent based, 95% solids, formed and coiled on release paper, tack-free in 24 hours, paintable, non-staining, plain preshimmed or reinforced as required for proper installation and setting of glass.

B. Miscellaneous Glazing Materials:

1. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
2. Setting Blocks: Neoprene or EPDM, 70-90 durometer hardness, with proven compatibility with sealants used.
3. Spacers: Neoprene or EPDM, 40-50 durometer hardness with proven compatibility with sealants used.
4. Compressible Filler (Rod): Closed cell or waterproof jacketed rod stock of synthetic rubber or plastic form, compatible space with sealants used, flexible and resilient, with 5-10 psi compression strength for 25% deflection.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, substructure and installation conditions. Do not proceed with glazing work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Protect glass from edge damage at all times during and after installation. Do not cut, seam, nip or abrade tempered glass.

B. Inspect each piece of glass immediately before installation and eliminate any which have observable edge damage or face imperfections.

C. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw, and bow oriented in same direction as other pieces.

D. Clean glazing channels and other framing members to receive glass immediately before glazing. Remove loose coatings. Apply primer to joint surfaces receiving sealants when recommended by sealant manufacturer.

3.03 INSTALLATION

A. Comply with combined recommendations and technical reports of manufacturer's of glass and glazing materials used with GANA "Glazing Manual", except when more stringent requirements are indicated.

B. Install insulating units to comply with recommendations by IGMA, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

C. Glazing channel dimensions shown are intended to provide for necessary bite on glass, minimum edge clearance and adequate sealant thickness, with reasonable tolerance. Adjust as required by job conditions at time of installation.

D. Install setting blocks of proper size at quarter points of sill rabbet. Provide spacers as required.

E. Install sealants, tapes, and gaskets in accordance with manufacturer's recommendations. Set glass without springing and install securely to prevent rattling or breakage.

F. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

G. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, to eliminate dirt and moisture pockets.

H. Clean and trim excess glazing materials from glass and stops or frames promptly after installation to prevent stains and discolorations.

3.04 FIELD QUALITY CONTROL

A. Watertight and airtight installation of exterior glass and glazing required. Each installation shall withstand normal temperature changes, wind loading, impact loading (for operating doors) without failure including loss or breakage of glass, failure of sealants of gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.

B. Repair glazing installation at leaks or, if leakage is excessive, replace glazing sealants and gaskets as directed.

3.05 PROTECTION AND CLEANING

A. Protect glass from breakage immediately upon installation by attachment of streamers to framing held away from glass. Do not apply markers of any type to surfaces of glass. Remove non-permanent labels and clean surfaces.

B. Maintain glass in a reasonable clean condition during construction so that it will not be damaged by corrosive action, and will not contribute (by wash off) to the deterioration of glazing materials and other work. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents and vandalism.

C. Wash and polish on both faces not more than four days before acceptance of the work. Comply with glass manufacturer's recommendations for final cleaning.

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD SYSTEMS

PART 1 GENERAL

1.01 SCOPE

A. Provide gypsum board systems consisting of wall board and framing as indicated and specified. Work includes:

1. Gypsum drywall wall systems.
2. Suspended drywall ceilings and soffits including suspension framing system.
3. Fire-rated gypsum drywall construction where indicated.
4. Exterior gypsum board sheathing.
5. Edge trim, corner beads, control joints, accent reveals, fasteners, joint treatment materials and other accessories required for a complete installation.
6. Includes installation of acoustical insulation specified in Section 07 21 00.

1.02 RELATED SECTIONS

A. Acoustical Panel Ceilings: Section 09 51 13.

B. Acoustical Insulation: Section 07 21 00.

1.03 QUALITY ASSURANCE

A. Gypsum Board Systems: Comply with ASTM C840 "Application and Finishing of Gypsum Board", and as specified.

B. Metal Framing System: Comply with ASTM C754 "Installation of Steel Framing Members to Receive Screw Attached Gypsum", and as specified.

C. Reference Standards: Wherever the following abbreviations are used herein they shall refer to the corresponding standard:

1. ASTM: American Society for Testing and Materials.
2. GA: Gypsum Association.

D. Fire-Rated Construction: Comply with fire resistance ratings indicated on drawings and as required by governing authorities and codes. Provide materials, accessories and application procedures that have been listed by Underwriters Laboratories or tested in accordance with ASTM E119 for the type of construction shown.

E. Guarantee: Submit written guarantee stating that cracks, delaminations or other imperfections in the drywall work which may develop within a period of 2 years from

date of acceptance will be repaired at no cost to the Owner.

F. Pre-Installation Conference: Conduct a pre-installation conference at Project site to review manufacturer's recommendations and referenced requirements for locating control joints in gypsum board walls and ceilings a minimum of one (1) week prior to beginning this portion of the Work. Have manufacturer's representative, contractor's representative and Architect present at this meeting. Conduct this conference to comply with requirements as outlined in Section 01 31 19, Project Meetings.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each gypsum board system component.

B. Submit manufacturer's certification that fire-rated assemblies proposed meet project requirements, including evidence of approved test reports acceptable to governing building code enforcing authorities, that assemblies when installed with proposed materials, will meet or exceed fire ratings required.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened labeled containers.

B. Store, protect and handle materials in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration. Protect cold-formed metal framing from corrosion, deformation and other damage during delivery, storage and handing per requirements of AISI's "Code of Standard Practice".

1. Protect adjoining surfaces against damage and soiling.

1.06 JOB CONDITIONS

A. Coordinate installation sequencing with work of other trades.

1. Verify completion of other work, including that of other trades, which will be concealed by gypsum drywall construction before installation of wallboard.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Gypsum Board: U.S. GYPSUM CO.; CELOTEX CORP.; FLINTKOTE CO.; GEORGIA-PACIFIC CORP.; GOLD BOND BUILDING PRODUCTS; DOMTAR GYPSUM.

B. Studs, Framing and Furring: DIETRICH; MARINO/WARE; CLARKWESTERN BUILDING SYSTEMS; STATE BUILDING PRODUCTS; gypsum board

manufacturers listed above.

C. Others as listed for specific products.

2.02 STEEL STUDS

A. Type: Screw type "C" shape, roll formed sheet steel members conforming to requirements of ASTM C645.

1. Material: ASTM A653 steel with minimum yield strength of 33 ksi.
2. Finish: Hot-dip galvanized coating, complying with ASTM A653 G40.
3. Gage and Width
   a. 25 gage x 3-5/8": Up to and including 14'-6" high.
   b. 20 gage x 3-5/8"
      1) Over 14'-6" up to and including 16'-5" high
      2) At wall mounted cabinet locations
      3) At walls receiving ceramic tile
   c. 20 gage x 4": Over 16'-5" up to and including 17'-6" high
   d. 20 gage x 6": Over 17'-6" up to and including 24'-0".
   e. 16 gage at door jambs, heavy equipment locations, and interior partitions receiving masonry veneer.
   f. Provide other gages or widths as indicated on drawings.
4. Thickness: Nominal 1-1/4".

B. Runners and Tracks: Designed and sized to receive studs. Gage to match studs except deflection tracks.

1. Ceiling Deflection Track: Provide one of the following:
   a. #53 FlexTrack, 20 gage typical, by SUPERIOR METAL TRIM PRODUCTS
   b. 20 gage top track with 2” minimum legs and 20 gage Spazzer 9200 Stud Spacer Bar by Dietrich Metal Framing
   c. Slip Track (Slp Trk) by BRADY CONSTRUCTION INOVATIONS
   d. The System by METAL-LITE
   e. The Three Legged Dog by FLEX-ABILITY CONCEPTS.
   f. A double slip track, 20 gage, can be used in lieu of the proprietary deflection tracks specified above. Legs of tracks shall be minimum 2".

C. Backing Plates (Blocking): Steel sheet for blocking; width to fit framing spacing; height to be 6” unless otherwise indicated.

1. Base Metal Thickness: Minimum 0.0598”.

D. Special Corner Plates: 20 gage galvanized sheet metal break metal; 5” x 5” x continuous length; one-piece. Provide at corner where studs cannot fill corners (i.e. 60 degrees corners, etc.).

2.03 CEILING/SOFFIT SUSPENSION SYSTEM

A. Provide the following materials unless otherwise indicated on the drawings. Metals used in exterior or areas subjected to moisture to be hot-dipped galvanized in accordance with ASTM A653 or A123 as applicable.

1. Main Runners: Cold-rolled steel channels; not less than 16 gage; G-90 galvanized finish for exterior and moist areas, black asphaltum painted for other areas. Spacing as required, but not to exceed 48" o.c.
   a. 1-1/2" deep where structural support framing is at 48" o.c. or less.
   b. 2" deep where structural support framing is over 48" and less than 66" o.c.
2. Cross Furring
   a. Cold-rolled steel channels, not less than 16-gage; 3/4" size; same finish as main runners.
   b. Hat shape, 7/8" deep, 25-gage. ASTM A653 G-60 hot-dipped galvanized.
   c. 2-1/2" x 20-gage, G-60 galvanized steel studs. Provide for multiple layer applications. Provide 12" long nested studs at suspension points.
3. Wire: Stainless steel 304 alloy for exterior conditions; galvanized soft annealed steel wire for interior conditions. Galvanized coating to meet or exceed Fed. Spec. QQ-W-461, Class 1.
   a. Tie Wire: Minimum 16-gage.
   b. Hanger Wire: Minimum 8-gage.

B. Optional Framing: At contractor's option, proprietary furring system may be used in lieu of black iron system for dry interior conditions without fire-rated requirements.

1. Description: System consisting of furring runners, furring tees, cross tees and hanger wires, designed and manufactured specifically for suspending gypsum board ceiling.
   a. Non-fire rated.
   b. Electrogalvanized, cold-rolled steel, 0.020" thick.
   c. Double web members; 1-1/2" high with 1-3/8" capped face.
2. Manufacturer: 640 System by CHICAGO METALLIC CORP.; Drywall Suspension System by USG, WORTHINGTON STEEL COMPANY, Watercheck LaFARGE GYPSUM.
3. Reference: ASTM C635, heavy duty.

2.04 METAL FURRING

A. Type: Galvanized steel, hat-section channel, unless otherwise indicated; 7/8" furring depth by 1-1/4" face width.

B. Manufacturer: DIETRICH Type FCE equal by CLARKWESTERN BUILDING SYSTEMS, MARINO/WARE, or by other gypsum board manufacturers listed in 2.01A.

C. Reference: ASTM C645.

2.05 GYPSUM BOARD

A. General: Comply with ASTM C1396.

B. Fire Rated Board: Type “C” or "X" (special fire retardant) to meet fire ratings for construction shown. Tapered edges. Thickness 5/8" unless otherwise indicated. Use at all locations indicated as meeting a specific fire resistance rating.

C. Moisture and Mold Resistant

1. ASTM C1396 (Section 5), regular type except where Type X fire-resistant type is indicated or required to meet UL assembly types.
2. Edges: Tapered.
3. Thickness: 5/8 inch, unless otherwise indicated.
4. Acceptable products: Mold Tough and Mold Tough Firecode (Type X) by USG; DensArmor Plus and DensArmor Plus Firecode (Type X) by GEORGIA-PACIFIC or equal by other gypsum board manufacturers listed in 2.01A.
5. Water Absorption: ASTM C473, the average water absorption for panels is not greater than 5 percent by weight after two-hour immersion.
6. Resistance to Mold Growth: ASTM D3273, “Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber,” the panel score was 10.
7. Use on non-ceramic tiled walls, ceilings and soffits in toilet rooms, shower rooms and drying rooms; on ceramic tiled non-wet walls in toilet rooms; walls and partitions above ceilings

D. Exterior Sheathing Board: Use for exterior sheathing and other areas where indicated on drawings. Provide in conformance with ASTM C1177, water repellent treated core and fiberglass face sheets. Dens-Glas by GEORGIA-PACIFIC or GlasRoc by BPB. 5/8" thickness unless otherwise indicated.

E. Impact Resistant Gypsum Wallboard: ASTM C1396 and ASTM C1278, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels, with core type and in thickness indicated, and with long edges tapered. Provide where indicated.

1. Minimum Physical Properties:
   a. Thickness: 5/8 inch.
   b. Screw Withdrawal (lbg): .104.
   c. Flexural Strength (lbf): 200.
   d. Fire Hazard Classification: Flame spread 5, smoke developed 0.
   e. Surface Abrasion (ASTM D4977: 25 pound weight, 50 cycles): 0.090 inch.
   f. Surface indentation (ASTM D5420): 0.14 inch.
   g. Soft Body Impact (ASTM E695)
      1) Surface Failure: 175 feet – pounds.
      2) Deformation Failure: 225 feet – pounds.
      3) Structural Failure: Greater than 300 feet – pounds.
2. Manufacturers: VHI Fiberock by USG, Hi-Impact 1000 by NATIONAL GYPSUM COMPANY, Tough Rock by GEORGIA PACIFIC or equal by

other gypsum board manufacturers listed in 2.01A.

F. Standard Board: 5/8" thick unless otherwise indicated. Tapered edges. Use at all locations except those indicated to receive a specific type of board.

G. Gypsum Liner Board: ASTM C442, Type X, 1" thick gypsum core with moisture resistant faces.

H. Tile Backer Board: See Section 09 30 00.

2.06 ACCESSORIES

A. Fasteners: Drywall screws and metal framing screws per manufacturer's instructions and recommendations for type and size, based on construction and conditions involved.

B. Trim

1. Corner Beads - Outside, Square Corners: 1-1/4 inch x 1-1/4 inch heavy gauge galvanized steel or vinyl, perforated.
   a. Metal: BEADEX MANUFACTURING; DIETRICH METAL FRAMING; CLARKWESTERN BUILDING SYSTEMS; listed gypsum board manufacturers
   b. Vinyl: VINYL TECH; VINYL CORP.
2. Corner Beads - Outside, Non-square Corners: BEADEX B-1 Splay Flexible Corner or equal. Concealed metal; two galvanized continuous strips laminated with paper trim; for application without mechanical fasteners.
3. Exposed Edges (Casing Beads): L-shaped trim, size to suit wallboard. J-shaped bead not permitted.
   a. Metal: DIETRICH METAL FRAMING M20B; BEADEX; DALE INDUSTRIES; listed gypsum board manufacturers.
   b. Vinyl: VINYL CORP. SB; VINYL TECH.
4. Control Joints
   a. Metal: Roll formed zinc, tape protected 1/4" wide x 7/16" deep control slot. DIETRICH No. 093; BEADEX; DALE INDUSTRIES; listed gypsum board manufacturers.
   b. Vinyl: VINYL CORP. No. CVJ-16; VINYL TECH. Tape protected 3/16" wide x 7/16: deep control slot.

C. Reinforcing Tape: Width to adequately cover joint.

D. Joint Taping Compound: Designed for bonding tape to wallboard and coating corner beads and fasteners.

1. Exterior Exposure: Type as recommended by board manufacturer.
2. Toxicity/IEQ: Lime compound. All purpose joint compound containing inert fillers and natural binders. Pre-mixed compounds shall be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds

E. Joint Topping Compound: Designed to sand smooth and feather well for finished

surface.

1. Exterior Exposure: Type as recommended by board manufacturer.
2. Toxicity/IEQ: Lime compound. All purpose joint compound containing inert fillers and natural binders. Pre-mixed compounds shall be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds

F. Additional Item: All additional accessories to complete work including nails and anchors to secure frames to walls and floors.

G. Acoustic Materials
1. Insulation: See Section 07 21 00.
2. Sealant: See Section 07 92 00.

PART 3 EXECUTION

3.01 GENERAL

A. Metal Furring and Framing: Comply with the requirements of ASTM C754 "Installation of Steel Framing Members to Receive Screw Attached Gypsum", and as specified.

B. Gypsum Board Systems: Comply with ASTM C840 "Application and Finishing of Gypsum Board", and as specified.

3.02 PREPARATION

A. Maintain uniform building temperature range not less than 55 degrees F., for 24 hours before, during and after gypsum panel installation and joint finishing treatment.

B. Provide adequate lighting and ventilation during installation and joint finishing treatment.

3.03 INSPECTION

A. Examine substrates and installation conditions. Do not proceed with gypsum wallboard work until unsatisfactory conditions have been corrected.

1. Protrusions of framing, twisted framing members, or unaligned members must be repaired before installation of wallboard is started.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.04 FRAMING INSTALLATION

A. Securely attach runner to floor with expansion anchors or other approved means.

B. Install all framing plumb and square with spacing as indicated.

C. Provide supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Company's "Gypsum Construction Handbook".

D. Bridging
   1. Up to 10 ft. Wall Height: 1 row.
   2. 10 ft. and Over Wall Height: 2 rows of bridging.

E. Provide a minimum of two (2) screws per connection.

F. Rated Stud Deflection Assembly: Install in accordance with manufacturer's instructions to provide required fire ratings. Ensure that anchoring devices, back-up material, clip supports and other materials are as used in referenced fire tests.

3.05 FURRING INSTALLATION

A. Ceiling Application: Install suspension system for ceilings and soffits, both interior and exterior, in accordance with manufacturer's instructions, shop drawings and as follows:

   1. Locate furring runners at 48" on center with hanger wires at 48" on center. Attach hanger wires to structural framing members specifically for this purpose. Attach hanger wires to framing wires using attachment devices whose suitability has been demonstrated by standard construction practice or by certified test data.
   2. Connect furring runners with furring tees spaced at 24" on center. Locate additional tees or hanger support as required for surface mounted and recessed ceiling and soffit items such as light fixtures, diffusers, etc. Add additional hanger wires as required to support all such items at each corner.
   3. Provide wall track wherever suspension meets a vertical surface.
   4. Brace suspension system for exterior ceilings and soffits to structure above to resist wind up-lift using metal channels or metal studs. Install after system is completely suspended to level plane.
   5. Do not support ceiling system from ductwork, electrical conduit, heating or plumbing lines, and vice versa. Each utility system and the ceiling system shall be a separate installation and each shall be independently supported from the building structure.
      a. If an interference occurs, provide trapeze type hangers or other suitable supports for each system. Locate hangers where they will not interfere with access to mixing boxes, fire dampers, valves and other appurtenances requiring servicing.

3.06 GYPSUM BOARD INSTALLATION

A. General

1. Pre-installation Conference: Before start of gypsum board installation, meet at the project site with the Architect and installers of related work, including work requiring openings, chases, frames, access panels, support, similar integrated requirements and mechanical and electrical trades. Review potential interferences and conflicts and coordinate layout and sequencing requirements for proper installation and integration of the work.
   a. Do not proceed with gypsum board installation until blocking, framing, bracing and other supports for subsequently applied work have been installed, reviewed and accepted by the Architect.
   b. Do not install gypsum board until work concealed by gypsum board has been installed.

B. Application

1. Install gypsum board face side out. Do not install imperfect, damaged or damp boards.
2. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.
3. Locate either edges or end joints over supports. Position boards so that both tapered edge joints abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
4. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.
5. Floating Construction: Install gypsum board with "floating" internal corner construction, unless isolation of the intersecting board is indicated.
6. In addition to compliance with the standards, comply with specific requirements indicated for each type of arrangement of gypsum wallboard system shown. Space fasteners in accordance with manufacturer's recommendations and complying with referenced standards.
   a. Walls and Partitions: Apply sheets horizontally or vertically. Provide maximum sheet lengths to minimize end joints with edges or ends over supports. In two layer applications, stagger joints of second layer from joints of first layer.
   b. Cut and install panels to eliminate vertical joints in corners of door frames to ceiling.
   c. Make cutouts to fit within wall plate, register and grille flanged. All cutouts made by knife or saw.
   d. Make angles and corners clean, true, plumb and square; walls plumb, flat and straight and ceilings flat and level.
   e. Ceilings: Apply gypsum board on ceilings, before application on walls and partitions. Install in direction and manner to minimize end joints. Stagger end joints over supports. In two layer applications, stagger joints of second layer from joints of first layer.

C. Direct-Glue Application

1. Apply gypsum vertically with closely butted joints within 10 minutes after application of mastic adhesive, sooner if recommended by manufacturer of adhesive. Apply firm hand pressure over entire board to effect a bond and to level board. Use slight sliding movement to position board. Shim drywall 1/4" off floor.
2. Apply mastic adhesive in amounts and at locations on board as recommended by adhesive manufacturer. Provide temporary fasteners or bracing as recommended until adhesive sets.

3.07 INSTALLATION OF SOUND RATED PARTITIONS

A. Provide sound-rated construction where indicated.

B. Acoustic Insulation: Install single layer of acoustic batt insulation in designated partitions after one side of gypsum board is installed, filling width and height of partition completely. Attach to gypsum board with adhesive spots to prevent subsequent displacement.

C. Extend partition stud system through acoustical ceilings to substrate. Apply gypsum board base panels full height, both sides of partition.

D. Seal partition perimeters. Provide continuous beads of acoustical sealant at juncture of both faces of runners or plates with floor and ceiling construction and wherever work abuts dissimilar materials. Seal prior to installation of sound attenuation insulation and gypsum board panels.

E. Provide continuous beads of sealant at juncture of gypsum board and abutting surface. Install gypsum board with 1/8" relief for sealant. Sealants to be contained within depth of gypsum board, not as a fillet.

F. At openings and cutouts, fill open spaces between edges of gypsum board and fixtures, cabinets, ducts, and other flush or penetrating items, with continuous bead of acoustical sealant.

G. If sound-rated partitions intersect non-sound-rated partitions, extend sound construction to completely close-off sound flanking paths through non-rated construction. Seal joints between face layers at vertical interior angles of intersecting partitions.

H. Exercise particular care at walls surrounding toilet areas and walls and ceilings surrounding mechanical spaces to provide properly constructed sound-rated gypsum board partition and ceiling systems.

I. Verify that electrical boxes are not located back-to-back; back-to back boxes to be offset at least one stud space. Do not close off non-complying conditions before notifying and receiving direction from Architect.

3.08 TRIM AND ACCESSORIES

A. Install corner beads at external corners of gypsum wallboard work. Use longest practical lengths.

B. Install edge trim wherever edge of gypsum board would be exposed or semi-exposed.

1. Provide beaded trim to receive joint compound at all gypsum wallboard work.
2. Provide L-type trim where work is abutted to other work and Kerf-type where work is kerfed to receive kerf leg.
3. Provide U-type trim where edge is exposed, revealed, gasketed or sealant filled, including expansion joints.

C. Attach to framing with screws. Clinch attachment to wallboard not acceptable.

D. Control Joints

1. Install control joints to isolate gypsum board surfaces as recommended by ASTM C840. Verify locations with Architect prior to installation. Generally locate joints as follows when:
   a. Partition, furring or column fireproofing abuts a structural element (except floor) or dissimilar wall or ceiling.
   b. Ceiling abuts a structural element, dissimilar wall or partition or other vertical penetration.
   c. Construction changes within the plane of the partition or ceiling.
   d. Partition or furring run exceeds 30'.
   e. Ceiling dimensions exceed 50' in either direction with perimeter relief; 30' without relief.
   f. Exterior ceilings and soffits exceed 20' in either direction; align with window mullions, when applicable.
   g. Wings of "L", "U", and "T"-shaped ceiling areas are joined.
   h. Expansion or control joints occur in the base exterior wall.
   i. Differential Deflection Conditions: All locations where partitions are supported by two or more structural members and subject to differential deflection by live or dead loading:
      1) Typical Framing Floor to Structure: Provide "Ceiling Deflection Track".
      2) Framing over One Floor (stairs, shafts, etc.): Provide control joints where studs are interrupted by structure.
2. Provide framing immediately on both sides of joint and back with 2"+/- gypsum board strips as required to maintain fire resistance rating.

3.09 FINISHING

A. Comply with manufacturer's instructions for mixing, handling and application of materials. Apply treatment at joints both directions, at flanges of trim accessories, penetrations of gypsum board (electrical boxes, piping and similar work), fastener heads, surface defects and elsewhere indicated. Apply in manner that will result in each of these items being concealed when applied decoration has been completed.

B. Prefill open joints of more than 1/16" with special chemical-hardening type bedding

compound, before bedding joint tape.

C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

D. Do not use topping compound for bedding joint tape.

E. Apply joint compound for the final coat of joint treatment, unless specifically recommended by the manufacturer for that use.

F. Walls Above Acoustical Ceiling Systems: Tape and fill joints with two coats of joint compound, sanding not required.

G. Leave all exposed surfaces smooth and even, ready for painting.

H. Provide where indicated on the drawings levels of finish as specified in ASTM C840, "Recommended Specification on Levels of Gypsum Board Finish". Levels of finish consist of:

1. Level 1 - **Areas Above Ceilings**: All joints and interior angles shall have tape embedded in joint compound. Provide surface free of excess joint compound. Tool marks and ridges are acceptable.
2. Level 2 – **As a Substrate for Ceramic Tile**: All joints and interior angles to have tape embedded in joint compound and one separate coat of joint compound applied over all joints, angles, fastener heads, and accessories. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
3. Level 4 – **All Areas Not Indicated to Receive Levels 1, 2 or 5**: All joints and interior angles to have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. All joint compound shall be smooth and free of tool marks and ridges.
4. Level 5 – **All Areas to Receive Semi-Gloss or Gloss Coatings**: All joints and interior angles to have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface. Excess material is to be removed leaving a film covering over the gypsum board paper surface.

3.10 ADJUST AND CLEAN

A. Remove any screw which does not engage into a framing member or spins freely.

B. When paper face is punctured, drive new screw approximately 1-1/2" from defective fastener and remove defective fastener. Fill damaged surface with compound.

C. Ridging

1. Do not repair ridging until condition has fully developed: approximately 6

months after installation or one heating season.

2. Sand ridges to reinforcing tape without cutting through tape.
3. Fill concave areas on both sides of ridge with topping compound.
4. After fill is dry, blend in topping compound over repaired area.

D. Fill cracks with compound and finish smooth and flush.

END OF SECTION

SECTION 09 30 00

TILE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Extent of tile work is shown on drawings and schedules, and as specified herein.

B. Types of tile work required including the following:

1. Ceramic wall tile, floor tile and base.
2. Backer board.

1.02 RELATED SECTIONS

A. Sealant: Section 07 92 00.

B. Concrete slab preparation: Section 01 73 00.

1.03 QUALITY ASSURANCE

A. Manufacturer: Provide tile of each type produced by a single manufacturer. Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

B. Installer: A firm with not less than 5 years experience in installing tile in applications similar to those required for this work.

C. Ceramic Tile Manufacturing Standard: TCA 137.1. Furnish tile complying with Standard Grade requirements unless indicated otherwise.

D. Proprietary Materials: Handle, store, mix and apply proprietary setting and grouting materials in compliance with manufacturer's instructions.

E. Installer to verify locations of all flexible joints required by the provisions of this section, by the recommendations of TCA, and by the recommendations of the related manufacturers. See Article 3.06.

1. Joint locations may not be indicated on the drawings.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical information and installation instructions for materials required. Include certifications and other data to show compliance with these specifications.

B. Samples: Submit manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors available, for each type of tile specified. Include samples of grout and accessories requiring color selection. Submit full size sample for each type of trim, accessory and color. Submit samples of metal edge strip.

C. Certification: Furnish Master Grade Certificate for each type of tile, signed by manufacturer and Installer.

1.05 PRODUCT HANDLING

A. Deliver packaged materials and store in original containers with seals unbroken and labels intact until time of use, in accordance with manufacturer's instructions.

1.06 JOB CONDITIONS

A. Maintain environmental conditions and protect work during and after installation in accordance with referenced standards and manufacturer's printed recommendations.

PART 2 PRODUCTS

2.01 CERAMIC TILE

A. Wall Tile, Floor Tile and Base: Cushion edge, standard grade, impervious porcelain ceramic tile conforming to ANSI 137.1. Provide trim pieces as required.

1. Walls: 6" x 6", glazed.
   a. Colors: Minimum of 2 colors per room will be used.
   b. Color Layout (Patterns): As indicated or as directed by Architect.
2. Floors: 12" x 12", unglazed. Provide abrasive grain for slip resistance.
   a. Colors: Minimum of 2 colors per room will be used.
   b. Color Layout (Patterns): As indicated or as directed by Architect.
3. Base: Provide 4" high, porcelain ceramic tile, cove base with square top, for meeting wall tile and bullnose top at terminations. Base pieces to be of length to match wall tile, or multiples of wall tile. Provide inside and outside corners and trim pieces as required.
   a. Color and finish to match wall tile as selected by Architect.
4. Manufacturer: Provide ceramic floor tile, wall tile and base as manufactured by one of the following subject to the above requirements.
   a. BUCHTAL.
   b. AMERICAN OLEAN TILE.
   c. DAL-TILE CORPORATION.
   d. MID-STATE TILE COMPANY.
   e. MONARCH TILE COMPANY.

   An unacceptable pattern or color match is reason for disapproval of product and manufacturer. No substitutions will be considered after bid opening.

2.02 MORTAR, GROUT AND ACCESSORIES

A. See Tile Installation Systems in Part 3 of this Section. Setting mortar and grout to be from same manufacturer.

B. Latex-Portland Cement Setting Mortar - Thin Set: Factory mixed mortar of Portland cement/sand, field gauged with undiluted latex admixture. Conform to ANSI A118.4, Latex-Portland Cement Mortar.

1. Provide one of the following:
   a. BOSTIK, Durabond D-50 or D-60.
   b. TEC (H.B. FULLER), Fullflex.
   c. MAPEI, Kerabond or Keralastic.
   d. LATICRETE, 255 MultiMax.

C. Dry-Set Mortar - Thin Set: Mixture of Portland cement with sand and latex, water imparting additive. Conform to ANSI A118.2, Conductive Dry-Set Portland Cement Mortar.

1. May be used in lieu of Latex-Portland Cement Setting Mortar for ceramic floor and wall tile.

D. Grout - Ceramic Tile: Integrally colored, sanded, non-staining, latex Portland cement, factory prepared (premixed) grouts gauged with undiluted latex additive. Color as selected by Architect.

1. Provide one of the following:
   a. BOSTIC, Hydroment.
   b. TEC (H.B. FULLER), AccuColor.
   c. MAPEI, Keracolor.
   d. LATICRETE, Grout.
2. Latex Additive: Liquid latex polyacrylate. Provide one of the following or equal by manufacturers listed above:
   a. MAPEI, Plastijoint
   b. TEC (H.B. FULLER), Grout Additive #TA869
   c. Similar types by BOSTIC or LATICRETE.

E. Membrane Waterproofing: Provide one of the following:

1. One component trowel applied elastomeric waterproofing membrane. Manufacturer's published literature must include statement that material allows for substrate movement of up to L/240. Hydroment Ultra-Set by BOSTIC or equal product by NATIONAL APPLIED CONSTRUCTION PRODUCTS, INC., TEC (H.B. FULLER) or CUSTOM BUILDING PRODUCTS that meet the specified requirements.
   a. Provide mat or tape accessories as recommended by waterproofing manufacturer to treat slab cracks and expansion joints.
2. Double coat, trowel applied, two-component material with 6 ounce fiber mesh reinforcing and sheet membrane for detail work at transitions in plane. Sheet membrane to be recommended and approved by waterproofing manufacturer for use in their system. Planicrete W Heavy-

Duty Double Coat System by MAPEI or equal products by CUSTOM BUILDING PRODUCTS, TEC (H.B. FULLER) or LATICRETE INTERNATIONAL INC.

F. Crack Isolation

1. Description: Minimum 40 mil, self-adhering membrane.
2. Manufacturer: 9235 Anti-Fracture Membrane by LATICRETE; ECB Antifracture Membrane by NAC PRODUCTS Composeal Gold by COMPOTITE CORPORATION; Nobleseal CIS by THE NOBLE COMPANY, TA139 Anti-Fracture Membrane by TEC (H.B. FULLER).

G. Metal Edge Trim: Provide type and depth trim as indicated. Provide in locations indicated. Also provide at control joints, between floor tile and dissimilar material and where thresholds do not occur. Except as otherwise indicated, where trim is located across door openings, locate trim on the door side in line with the edge of the door stop, terminating at the rabbet. Provide stainless steel products.

1. Manufacturer: SCHLUTER, CERAMIC TOOL COMPANY, BLANKE. Styles as indicated or required by substrate conditions.

2.03 TILE BACKER BOARD

A. Description: Nominal 1/2" thick cementitious board with fiberglass mesh reinforcements conforming to the requirements of ANSI A118.9..

1. Provide cadmium plated screws, type as recommended by board manufacturer.
2. Joint Treatment Tape: 2" wide, 10x10 glass mesh type or similar type as recommended by board manufacturer.

B. Manufacturer: Wonder Board by MODULARS, INC.; Util-A-Crete by FIN PAN; Durock Interior Tile Backer Board by U.S. GYPSUM; Dens-Shield by GEORGIA PACIFIC.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine surfaces to receive tile, setting beds and accessories before tile installation for the following:

1. Defects or conditions adversely affecting quality and execution of the installation.
2. Deviations beyond allowable tolerances of surfaces to receive tile.
3. Do not proceed with installation work until unsatisfactory conditions are corrected.

B. Conditions of surfaces to receive tile.

1. Surfaces to be firm, dry, clean, and free of oily or waxy films or curing compounds.
2. Grounds, anchors, plugs, hangers, bucks, electrical, plumbing and HVAC work in or behind tile to be installed prior to proceeding with tile work.

3.02 PREPARATION

A. Prepare surfaces to receive tile as required to achieve proper bond and as recommended by the Tile Council of America.

1. See Section 01 73 00 for additional floor preparation requirements.

B. Fill cracks, low areas and pits in concrete with self-leveling fill of type recommended by tile manufacturer for substrate conditions encountered.

C. When required, lightly grind concrete subfloors with a terrazzo grinder to remove trowel marks or other surface irregularities which will telegraph to the flooring surface.

D. Sawcut or grind transition areas as required to install tile as indicated.

E. Clean surfaces in a manner suitable for proper installation. Verify that slabs are free of curing membranes, oil, grease, wax, dust and other materials deleterious to tile installation.

F. Primers or other preparations required or recommended in accordance with manufacturer's instructions.

3.03 TILE BACKERBOARD

A. Location: Provide tile backerboard on metal stud walls as a substrate for ceramic tile products specified herein which are located on toilet room wet walls and other areas where indicated.

B. Install in strict accordance with manufacturer's recommendations and ANSI A108.11, Interior Installation of Cementitious Backer Units.

1. Butt ends and edges of adjacent panels.
2. Attach with screws spaced at 6 inch centers on perimeter and field.
   a. Maintain minimum 1/2 inch from screws to panel edge.
   b. At wainscot or similar location where tile terminates in same plane of wall, shim tile backerboard flush with adjacent wall board. Provide shims continuous along face of studs.
3. Locate control and expansion joints in same locations as substrate and where required by wall tile.
4. Apply glass mesh tape, or type recommended by board manufacturer, over joints. Embed tape in setting material indicated for specified tile finish.

3.04 WALL TILE INSTALLATION - SYSTEMS

A. Prepare surfaces, fit, set or bond, grout, and clean in accordance with Tile Council of America, "Handbook for Ceramic Tile Installation", 2008 Edition; and as follows:

B. Interior Stud Walls - Over Tile Backerboard: TCA W244, dry-set mortar bond coat or latex Portland cement bond coat and grout.

1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.
3. Backerboard
   a. Joint Preparation: Fill joints completely with setting mortar and embed 2 inch wide coated fiberglass tape into skim coat of same mortar.
   b. Apply setting mortar in one layer, troweling skim coat with trowel's flat edge and then texturing with appropriate notched trowel. Troweling equipment must be appropriate for type of tile work and in good condition.

C. Interior Stud Walls - Over Gypsum Board: TCA W243, dry-set mortar bond coat or latex Portland cement bond coat and grout.

1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.

3.05 FLOOR TILE INSTALLATION - SYSTEMS

A. Prepare surfaces, fit, set or bond, grout, and clean in accordance with Tile Council of America, "Handbook for Ceramic Tile Installation", 2008 Edition; and as follows:

B. Interior Floor - Thin Set, Waterproof Membrane: TCA Design F122, waterproofing, latex Portland cement bond coat and grout.

1. Install in strict conformance with waterproofing membrane manufacturer's written instructions and recommendations.
2. Tile: ANSI A108.5.
3. Grout: ANSI A108.10.

C. Interior Floor - Thin Set, Without Waterproof Membrane: TCA design F113, latex Portland cement mortar and grout or dry-set mortar and grout.

1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.

3.06 TILE INSTALLATION - PROCEDURES

A. Anti-Fracture Membrane: Install over floor cracks. Discontinue at control and expansion joints. Install in compliance with manufacturer’s instructions and shop drawings. Seam joints as recommended by manufacturer.

B. Extend tile work into recesses and under or behind equipment and fixtures, to form

a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars or covers overlap tile.

D. Placement Methods: Install tile using the hereinbefore specified setting beds and grouts.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting.

1. Avoid tile layout with less than half width tiles at room/area perimeters, unless otherwise indicated on the floor layout drawings. Notify Construction Manager if layout not achievable per layout indicated on the drawings. Do not continue in room/area in question until approved by the Associate.
2. Provide uniform joint widths, unless otherwise shown.
   a. Provide 1/4” joints for large format ceramic tile.

3.06 FLEXIBLE JOINTS

A. Locate flexible joints (expansion, control and isolation joints) prior to tile installation. See Quality Assurance in Part 1 herein.

B. Provide flexible joints as specified herein, unless more stringent requirements are indicated on drawings. Provide as specified, regardless if not indicated on drawings.

C. Joint to be continuous from face of tile to bottom of setting bed or leveling bed. Reinforcing to be discontinued at joint. Install continuous joint filler material in joint from setting or leveling bed to a point below face of tile adequate for proper placement of backing rod and sealant.

D. Joint Design: TCA design EJ171 as applicable. See Section 07 92 00 for sealant. Provide at the following locations:

1. Horizontal Surfaces
   a. Directly over joints in structural floor, including cold joints, construction joints, control joints, and expansion joints.
   b. Where tile work abuts restraining surfaces such as perimeter walls, curbs, columns, pipes, etc.
   c. Floor areas exceeding 24 feet in any direction.
   d. Where indicated.
2. Vertical Surfaces

a. Directly over joints in wall substrate including cold joints, construction joints, control joints and expansion joints.
b. At changes in substrate material.
c. Where tile work abuts restraining surfaces such as perimeter walls, curbs, columns, pipes, etc.
d. Where indicated.

E. Curing: Cure tile floor, base, and wall installations in accordance with manufacturer's recommendations, TCA recommendations, and in accordance with ANSI requirements.

F. Metal Edge Strips: Provide metal edge strips at openings without thresholds, and where exposed edges of tile floors meet other materials.

3.07 REPAIR, CLEAN AND PROTECT

A. Repair, or remove and replace chipped, damaged or otherwise defective work to the satisfaction of the Architect.

B. Cleaning: Upon completion of placement and grouting, clean all tile surfaces so that they are free of foreign matter.

1. Use methods and materials as recommended by tile manufacturer.
2. Replace tiles that cannot be satisfactorily cleaned.

C. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent damage and wear.

1. Prohibit foot and wheel traffic from using tiled floors for at least 3 days after grouting is completed.
2. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide acoustical lay-in panel ceiling system as shown and specified.

1.02 RELATED SECTIONS

A. Gypsum Board Ceiling: Section 09 21 16.

1.03 QUALITY ASSURANCE

A. Workmanship: Comply with Ceilings & Interior Systems Contractors Association (CISCA) Code of Practices.

B. Installation: Performed by an experienced authorized installer approved by acoustical material manufacturer.

C. Fire Hazard Classification: Provide acoustical materials which have been UL tested, listed and labeled Class 0-25, when tested in accordance with ASTM E84, Class A flame spread rating in accordance with ASTM E1264 requirements.

D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standards.

1. AIMA: Acoustical and Insulating Materials Association.
2. ASTM: American Society for Testing and Materials.
3. CISCA: Ceilings and Interior Systems Contractors Association.

E. Coordination Between Trades: Quality assurance includes the cooperation with HVAC, Plumbing and Electrical Contractors in regards to ceiling grid layout.

1. Procedures for submitting coordination drawings for ceiling work is included in Section 01 33 23 - Shop Drawings, Product Data and Samples.

1.04 SUBMITTALS

A. Product Data

1. Submit manufacturer's product data and installation instructions for each type of acoustical material and suspension system required.

2. Submit manufacturer's written instructions for recommended maintenance practices for each type of acoustical ceiling system required. Include

recommendations for cleaning and refinishing acoustical units and precautions against materials and methods that may be detrimental to finishes and acoustical performances.

B. Samples: Submit 12" square acoustical panel samples for each type of acoustical unit required. Provide 12" long suspension system and edge molding samples.

C. Certification: Submit manufacturer's certification of acoustical units fire hazard classification rating and performance requirements.

D. Maintenance Materials: Provide 2% each type and color of acoustical material supplied for replacement and maintenance purposes. Provide full size units, matching units installed, in properly labeled unopened or resealed boxes.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unopened protective packaging, with manufacturer's labels indicating brand name, pattern size, thickness and fire rating as applicable, legible and intact.

B. Store materials in original protective packaging to prevent soiling, physical damage or wetting.

C. Store cartons open at each end to stabilize moisture content and temperature.

D. Do not begin installation until sufficient materials to complete a room are received.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Pressurized Plenums (to comply with CISCA's recommendations for cleaning duct system and protecting ceiling units in pressurized plenums from damage and soiling caused by blowing dirt and dust that may be present when duct system is first operated): Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 PRODUCTS

2.01 SUSPENSION SYSTEM

A. Exposed "Tee" Grid System

1. Description: Cold-rolled electrogalvanized steel, factory applied white finish. SA-1: 15/16” exposed face; DONN (USG INTERIORS) Model DX; CHICAGO METALLIC 200 Snap Grid System; ARMSTRONG Prelude.

2. Description: Comply with ASTM C635. Provide systems adequate to support light fixtures, ceiling diffusers, and other normal accessories. Maximum deflection 1/360 of the span. All components of system from one manufacturer, die cut, and interlocking.
   a. Structural Class: Intermediate duty.
   b. Type of System: Direct Hung.
   c. Attachment Devices: Size for five times design load indicated in ASTM C635, Table 1 direct hung.
   d. Hanger Wires: ASTM A641 galvanized carbon steel, soft temper, prestretched not less than 12 gauge.
   e. Carrying Channels: 1-1/2" steel channels, hot-rolled or cold-rolled, not less than 0.475 lbs per linear foot, standard finish.
   f. Members: Provide manufacturer's standard exposed runners, cross runners and accessories of type and profiles indicated, with exposed cross runners coped to lay flush with main runners.
   g. Hold Down Clips: Manufacturer's standard; provide in areas not scheduled to receive retention clips.
   h. Retention Clips at Impact Resistant Ceiling: Manufacturer's standard retention clips designed and spaced to secure acoustical tiles in-place against vandalism in public areas.
3. Edge Moldings: Hemmed edge wall angles, cold-rolled electrogalvanized steel, factory applied finish to match grid system.

2.02 ACOUSTICAL UNITS

A. Acceptable Manufacturers: The following models listed are by ARMSTRONG. Equal products by CELOTEX or U.S. GYPSUM are acceptable.

B. Panel Types: Type SA-1: Cortega #769, 24” x 48”, square edge for 15/16” grid, NRC range .55, CAC 35, light reflectance LR-.82, with white.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, structure and installation conditions. Do not proceed with acoustical ceiling systems work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half widths units at borders.

B. Coordinate with ceiling layout on drawings.

C. Notify Architect of discrepancies between ceiling layout on drawings and ceiling layout proposed. Do not proceed until approved by Architect.

3.03 INSTALLATION

A. Suspension System: Comply with ASTM C636 requirements and be water or laser leveled, maximum deflection of 1/360 of span and maximum surface leveling tolerance 1/8" in 12'-0".

B. Rough Suspension

1. Hangers: Ceiling suspension systems shall not be supported from ductwork, electrical conduit, heating or plumbing lines or any other utility lines. Each utility and the ceiling suspension system shall be a separate installation and each shall be independently supported from the building structure. Where interferences occur, employ trapeze hangers or supports to avoid interferences with appurtenances requiring servicing. Support all four corners of suspension systems at fluorescent light fixtures.
2. Wall Molding
   a. Provide edge trim molding at perimeter of acoustical ceiling installation and intermediate vertical surfaces. Use maximum lengths. Miter trim corners to provide tight, accurate joint. Connect moldings securely to substrate surfaces.
   b. Connect moldings to substrate at intervals not over 16" on center and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0".
3. Hold-Down Clips: Provide on all panels adjacent to light fixtures.
[4. Retention Clips: Provide on all tiles in areas listed herein.]

C. Acoustical Units

1. Install acoustical lay-in panels level, in uniform plane, with joints snug and square and panels free from damage or soiling.
   a. Fit border units accurately at borders and penetrations.
   b. Recreate tegular and decorative edges at wall cuts and other cuts.
2. Coordinate suspension systems grid layout with electrical lighting fixture lay-out and installation.

3.04 CLEANING

A. After installation, clean soiled or discolored surfaces of acoustical units and exposed suspension members. Comply with manufacturer's recommendations for cleaning and touch-up of minor finish damage.

B. Adjust all sags and twists which develop in ceiling systems. Remove and replace units which are improperly installed and damaged units which cannot be successfully cleaned and repaired to eliminate evidence of damage.

END OF SECTION

SECTION 09 65 00

RESILIENT FLOORING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide resilient flooring as shown and specified. Work includes:

1. Vinyl composition tile flooring.
2. Base.
3. Adhesives and accessories to complete the work.

1.02 RELATED SECTIONS

A. Concrete slab preparation: Section 01 73 00.

1.03 QUALITY ASSURANCE

A. Provide each type of resilient flooring and base material produced by one manufacturer, including recommended adhesives and leveling compounds.

B. Provide each type resilient flooring and base material from same production run. Colors shall be uniform throughout.

C. Fire Test Performance: Provide materials complying with referenced standard fire tests.

1. ASTM E84 (Tunnel Test): Flame spread less than 75 (Class B).
2. ASTM E162: Flame spread less than 75 (Class B).
3. U.L. 992: Flame propagation index less than 2.0.

D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

1. ASTM: American Society for Testing and Materials.
2. FS: Federal Specifications as established by the U.S. Government, General Services Administration.
3. U.L.: Underwriter's Laboratories.
4. ADA: Americans with Disabilities Act Accessibility Guidelines.

E. Slip Retardant Performance: Unless a greater performance is specified under a specific product, all floor materials must have a minimum static coefficient of friction of 0.6.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of

resilient flooring, base and accessory required.

B. Samples

1. Tiles: Submit full sized samples of each type, color and pattern required to illustrate the full range of color variations.
2. Base: Provide 6" lengths of each type and color.

C. Submit manufacturer's certification that resilient flooring furnished complies with required fire test performance and has been tested and meets indicated requirements.

D. Submit manufacturer's written instructions for recommended maintenance practices for each type of resilient flooring, base and accessory material required.

E. Extra Stock: Furnish extra materials in the following quantities:

1. Tiles and Base: Furnish 2% of the total quantity (but not less than 2 full sealed cartons) of each type, pattern and color. Provide 5% of colors with less than 5000 square feet. Properly package and identify each material.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened labeled containers.

B. Store, protect, and handle resilient flooring materials in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration.

C. Store materials in areas to receive resilient flooring for a minimum of 48 hours before installation.

1.06 PROJECT CONDITIONS

A. Maintain uniform room temperature range not less than 70 degrees F., in areas to receive resilient flooring for minimum 48 hours before installation and 48 hours after installation.

B. Provide adequate lighting and ventilation during installation and clean-up.

C. Protect adjoining surfaces from damage and soiling.

PART 2 PRODUCTS

2.01 RESILIENT FLOORING MATERIALS

A. Vinyl Composition Tile: ASTM F1066, Class 1 or 2 as applicable, 12" x 12" x 1/8", manufactured without asbestos.

1. Colors, Patterns and Manufacturers

a. Basis of Design: Colors and types indicated on the drawings are based on ARMSTRONG.
b. Other Acceptable Manufacturers: Products manufactured by MANNINGTON or TARKETT are acceptable providing they meet the requirements specified herein and are an acceptable color match as approved by the Architect. Color match should be submitted to the Architect during bidding for inclusion by an Addendum.

B. Vinyl Base – Standard Type: Complying with ASTM F1861, Type TV, Group 2, 6" high, 1/8" gage. Provide long length rolls and job formed corners. Standard top set cove (Style B) at resilient and other hard surface flooring and straight toeless (Style A) at all carpeted floors. Base shall contain a minimum of 90 percent recycled material.

1. Colors and Manufacturers
a. Basis of Design: Colors and types indicated on the drawings are manufactured by JOHNSONITE.
b. Other Acceptable Manufacturers: Products manufactured by VINYL PLASTIC, INC. (VPI) or ROPPE are acceptable providing they meet the requirements specified herein and are an acceptable color match as approved by the Architect. Color match should be submitted to the Architect during bidding for inclusion by an Addendum.

2.02 ACCESSORIES

A. Concrete Slab Prime: Non-staining type, compatible with adhesive, as recommended by flooring manufacturer.

1. Moisture Emissions Sealer: Epoxy type similar to CHEMREX CX Concrete Floor Primer, SINAK Sealer P-105 or equal type specifically formulated for moisture emission control.

B. Leveling Compound: Non-staining latex modified, Portland cement based type, compatible with flooring, as provided or recommended by the flooring manufacturer.

C. Adhesives: Waterproof, stabilized type as recommended by the resilient flooring and base manufacturer to suit material and substrate conditions.

D. Resilient Edge Strips: 1/8" thick homogeneous vinyl or rubber composition, tapered or bullnose edge, color to match flooring, or as selected by Architect from standard colors; not less than 1" wide.

E. Cleaning and Polishing Materials: Polish and neutral cleaner as recommended by the floor material manufacturer.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates and installation condition. Do not proceed with resilient flooring work until unsatisfactory conditions have been corrected.

B. Subfloor surfaces shall be smooth, level, at the required finish elevation, and within the tolerances specified in Section 03 30 00.

C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Before installing flooring, vacuum clean substrate surfaces and inspect subfloor to verify that concrete slab complies with ASTM F710.

1. When required, lightly grind concrete subfloors with a terrazzo grinder to remove trowel marks or other surface irregularities that will telegraph to the flooring surface.
2. Fill cracks, low areas and pits in concrete with self-leveling fill of type recommended by flooring manufacturer for substrate conditions encountered.
3. Perform bond, alkalinity and moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured and are ready to receive flooring.
4. Moisture Testing
   a. Perform anhydrous calcium chloride test, ASTM F1869. Proceed with installation only after substrates have a maximum moisture vapor emission rate of 3 lbs. of water/1000 sq. ft. in 24 hours.
   b. Proceed with installation only after substrates pass testing.
   c. If after 120 days of slab placement moisture levels are not within the specified limits, apply floor primer as specified below.
5. Apply primer, if moisture emissions are greater than the specified amount or for other purposes as recommended by flooring manufacturer, before application of adhesive. Apply in compliance within manufacturer's recommended limits.

3.03 INSTALLATION

A. Install resilient flooring and accessories with adhesive in strict compliance with the manufacturer's recommendations. Butt tightly to vertical surfaces, thresholds, nosings and edgings. Scribe around obstructions and to produce neat joints, laid tight, even and straight. Extend flooring into toe spaces, door reveals and into closets and similar openings.

B. Tile Flooring

1. Lay tile flooring with joints tight, in true alignment and parallel to walls of rooms and corridors.
2. Lay tile symmetrically about centerlines of space, without pattern or

borders. Adjust layout to avoid use of cut widths less than one-half tile at room perimeter.

3. Match tile for color by using manufactured and packaged sequence.
4. Broken, cracked, or deformed tiles are not acceptable.
5. Immediately after installation, thoroughly roll tile with a 150 lb. sectional roller until a firm, uniform bond has been obtained.

C. Static Dissipative Tile Flooring: In addition to the above requirements, conform to ARMSTRONG Installation System Manual F-5061 or similar type recommended system by other approved manufacturer.

D. Base

1. Install at walls, column, casework and other permanent fixtures as scheduled. Install in as long of lengths as practicable. Tightly bond base to backing throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
2. Provide terminal base ends beveled and toes rounded.
3. On masonry surfaces or other similar irregular surface, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

E. Edge Strips: Place tightly butted to flooring and secure with adhesive. Install at edges of flooring which would otherwise be exposed.

3.04 CLEANING AND PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. After flooring has set, clean thoroughly. Remove excess adhesive or other surface blemishes from flooring, using neutral type cleaners as recommended by the flooring manufacturer.

C. Perform initial maintenance according to latest edition of manufacturer's maintenance manual and the following:

1. Vinyl composition Tile: Clean, apply polish, and buff with type of polish, number of coats and buffing procedures in accordance with manufacturer's instructions.

D. Protect installed flooring from damage and staining with heavy duty non-staining Kraft paper or other covering at all traffic lanes. Protect completed work from traffic and damage until final acceptance.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.01 SCOPE

A. Work Included

1. Surface preparation and painting or finishing of all interior and exterior exposed items and surfaces except as otherwise indicated. Work includes, but is not necessarily limited to, the following:
   a. Walls, ceilings and soffits of gypsum board.
   b. Concrete surfaces where indicated.
   c. Hollow metal doors and frames.
   d. Wood doors, frames, trim, casework and millwork as required.
   e. Exposed structure including deck and all framing.
   f. Exposed ferrous metal of any type, interior and exterior, including galvanized items.
   g. Exposed sheet metal, ductwork, conduit and piping in finished areas; not mechanical equipment or electrical equipment rooms.
   h. Exposed prime coated or unfinished mechanical or electrical items outside of mechanical equipment rooms. Repaint factory finished mechanical or electrical items where specified.
   i. Stenciling of fire walls above ceilings.
   j. Other items noted or specified.
2. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under other sections of the work.

B. Mechanical Equipment Rooms: Painting subject to the following requirements:

1. Paint finish on walls and ceiling, when scheduled on drawings, to be applied prior to installation of mechanical/electrical work as much as possible.
2. Spray painting not permitted after electric motors have been installed.

C. Work Excluded: Do not paint the following items unless specifically called for to be painted herein or where idicated on the drawings.

1. Prefinished items include the following factory-finished components:
   a. Architectural woodwork.
   b. Acoustical wall panels.
   c. Toilet enclosures.
   d. Finished mechanical and electrical equipment.
   e. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    a. Foundation spaces.
    b. Furred areas.
    c. Ceiling plenums.
    d. Pipe spaces.
    e. Duct shafts.
3. Finished metal surfaces include the following:
    a. Anodized aluminum.
    b. Stainless steel.
    c. Chromium plate.
    d. Copper and copper alloys.
    e. Bronze and brass.
4. Operating parts include moving parts of operating equipment and the following:
    a. Valve and damper operators.
    b. Linkages.
    c. Sensing devices.
    d. Motor and fan shafts.
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Surface Preparation

1. It is the intention of this specification that new substrates will be ready for decoration as specified herein except for normal construction dust and soiling.
2. Surfaces installed by other trades are required to be acceptable for work specified under Part 3, Surface Preparation. Specifically, surfaces to be clean, sound, free from loose particles, dirt, loose mortar and grease.

1.02 RELATED SECTIONS

A. Metal Building Finish requirements: Section 13 34 19.

1.03 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions; including rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures; includes installations within unheated shelters.

1.04 QUALITY ASSURANCE

A. Application: Performed only by skilled, experienced painters.

B. Provide lead free prime and finish coatings. All top coatings shall be mold and mildew resistant.

C. Coordination: Provide finish coats compatible with prime paints used. Review other specification sections to ensure compatibility of total coating system with prime paints provided for the various substrates. Provide barrier coats over non-compatible primers or remove primer and reprime as required. Notify the Architect of anticipated problems using coating systems specified on substrates primed in accordance with other section requirements.

D. Reference Specifications

1. The following Society for Protective Coatings (SSPC) specifications are referenced by code number within this Section.

Code	Method
SP-1	Solvent Cleaning
SP-2	Hand Tool Cleaning
SP-3	Power Tool Cleaning
SP-6	Commercial Blast Cleaning
SP-11	Power Tool Cleaning to Bare Metal

E. Job Mock-Ups: Provide only if required by the Owner. Mock-ups will serve as standard for acceptance of work. Leave approved mock-ups in place as part of completed project. Manufacturers' representatives shall be available to advise applicator on proper application techniques and procedures. Locate as directed.

F. Paint walls prior to installing wall mounted signage.

1.05 SUBMITTALS

A. Submit a complete selection of manufacturer's color chips indicating color, texture and sheen for approval for each finish specified herein.

B. Submit a complete schedule for identifying manufacturer and specific brand name or number of products proposed for finishing specified surfaces.
1. Provide percent of solids by volume content data for each paint material.
2. Provide paint label analysis and application instructions for each type paint.

C. Provide the following quantities of paint of each type and color required for maintenance purposes. Provide original, unopened, labeled containers with color samples and a list of project use. Extra materials are not to be used for touch-up by Contractor.

1. Metals and Wood: 2 gallons.
2. Gypsum Board: 5 gallons.

D. Color/Finish Samples

1. After receiving color chips from the Contractor, the Architect will provide a complete schedule of colors and sheens desired.
2. Obtain schedule well in advance of commencing work and submit samples of specified finishes for approval.
3. Submit duplicate samples on the same kind of materials to which finishes will be applied. One half of the sample shall show the completed treatment and the other half shall show the successive steps, taken in producing the finish. When approved, samples will be so marked; one set will be retained by the Architect and one set will be returned for the painter's use.
4. No finishes shall be applied on the work until samples are approved. Approved samples shall be strictly duplicated in the work. Additional coatings, if required to reproduce approved samples, shall be applied without additional cost to the Owner.
5. Use representative colors when preparing samples for Architect's review.

E. Statement From Manufacturer

1. Contractor, in submitting the list of proposed subcontractors, shall include for approval, along with the name of the painting subcontractor, the names of the manufacturers whose materials the subcontractor proposes to use in the work.
2. Following tentative approval of the subcontractor and the materials manufacturers, notify the manufacturers, in writing, that the specifications require the manufacturers to submit to the Architect, a statement by a corporate officer of the manufacturer that coatings scheduled by the Architect are proper for the intended use and that the manufacturer's representative will be available to advise the Architect and the Contractor regarding applications of all coatings.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials on the job site in original, new, unopened packages and containers bearing the manufacturer's name, label and the following information:
1. Name or title of material.
2. Manufacturer's stock number and date of manufacture.
3. Manufacturer's name.
4. Contents by volume, for major pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.

B. Store, protect and handle materials in accordance with manufacturer's recommendations to prevent damage and deterioration. Store paint materials at minimum of 50° F.

C. Maintain paint material storage space as clean, non-hazardous and orderly. Place waste and soiled paint rags in tightly covered metal containers; safely dispose of at end of each working day. Take every precaution to avoid fire hazards and spontaneous combustion. Provide acceptable type of fire extinguisher immediately adjacent to paint storage area.

1.07 PROJECT CONDITIONS

A. Coordinate painting and finishing work with other trades to ensure adequate illumination, ventilation and dust-free environment during application and drying of paint and finish treatments.

B. Maintain uniform interior building temperature of minimum 50° F for 24 hours before, during and continuously for 48 hours after painting.

C. Do not apply coatings when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Provide adequate ventilation as required for specified paint and finish treatment materials in spaces scheduled. Maintain for time periods recommended by material manufacturer to provide proper drying.

E. Provide adequate illumination on surfaces to be finished. Maintain a minimum 80 foot candle lighting level measured mid-height at substrate surface.

F. Protect adjoining surfaces against damage or soiling.

G. Maintain work in neat and orderly condition, promptly removing empty containers, wrappings, soiled rags, waste and rubbish from site.

H. Material Safety Data Sheets (MSDS): Provide documents available to Owner's Representative, Architect and construction personnel at the job site. Comply with MSDS requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Paint: Brands of paint and stain are specified only to establish a standard of quality and color (where applicable). Other paint brands and manufacturers such as BENJAMIN MOORE; ICI (DEVOE; GLIDDEN); MARTIN SENOUR; PPG; PRATT AND LAMBERT; PORTER; CORONADO PAINT COMPANY, SHERWIN WILLIAMS are acceptable upon proof of satisfactory experience records for the intended use.

2.02 MATERIAL QUALITY

A. Provide the best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying the manufacturer's identification as standard, best-grade product will not be acceptable.

B Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only to recommended limits.

C. Provide paints of durable and washable quality. Use paint materials that will withstand normal washing as required to remove pencil marks, ink, ordinary soil, etc., without showing discoloration, loss of gloss, staining or other damage.

D. Stains: Factory-mixed, penetrating, transparent oil-base type. Applicator shall be allowed to add approved colorants on the job to match approved samples. No other ingredients shall be added to stains.

2.03 ACCESSORY MATERIAL

A. Application Equipment: Not required to be new, but shall be adequate for the work and workmanship required herein.

B. Accessories: Provide all required ladders, scaffolding, drop cloths, masking, scrapers, tools, dusters and cleaning solvents as required to perform the work and achieve the results specified herein.

C. Secondary products not specified by name (i.e. turpentine, thinners, mineral spirits, fillers, linseed oils, etc.) shall be "best grade" or "first line" products.

1. Filler material shall be woodworker's option of material that can be tinted and worked so as to match adjacent wood surfaces.

2.04 EXTERIOR PAINT AND FINISH MATERIAL SCHEDULE

A. Apply paint and finish materials to substrate surfaces indicated. Apply touch-up prime coats in addition to shop-applied prime coats. Provide additional job site prime coats when indicated.

B. Metal – Ferrous: Galvanized and Shop Primed

1. SW
   a. Finish: S-W Metalatex Semi-Gloss Enamel B42 Series. Two (2) coats at minimum 2.0 mil dft per coat. 34% to 38% solids; VOC 125 g/L
2. PPG
   a. Primer: Pitt-Tech Interior/Exterior Primer DTM Industrial Enamel 90-712 Series. One (1) coat at minimum 2.0 mils dft. 37% to 41% solids; VOC 116 g/L.

b. Finish: Interior/Exterior Semi-Gloss Acrylic Metal Finish 7-374 Series. Two (2) coats at minimum 1.5 mils dft. 32% to 36% solids; VOC 77 g/L.

3. ICI DULUX
   a. Primer: Ultra-Hide Aquacrylic Gripper #3210 Series; One (1) coat at minimum 2.0 mils dft. 49% to 51% solids; VOC 95 g/L.
   b. Finish: Ultra-HideDurus Exterior Acrylic Semi-Gloss #2416 Series; Two (2) coats at minimum 1.5 mils dft. 40% to 42% solids; VOC 79 g/L.

C. Metal – Ferrous: Unprimed

1. SW
   a. Primer: DTM Acrylic Primer B66W1. One (1) coat at minimum 2.5 mil dft. 44% to 48% solids; VOC 138 g/L.
   b. Finish: S-W Metalatex Semi-Gloss Enamel B42 Series. Two (2) coats at minimum 2.0 mil dft per coat. 34% to 38% solids; VOC 125 g/L
2. PPG
   a. Primer: Pitt-Tech Interior/Exterior Primer DTM Industrial Enamel 90-712 Series. One (1) coat at minimum 2.0 mils dft. 37% to 41% solids; VOC 116 g/L.
   b. Finish: Interior/Exterior Semi-Gloss Acrylic Metal Finish 7-374 Series. Two (2) coats at minimum 1.5 mils dft. 32% to 36% solids; VOC 77 g/L.
3. ICI DULUX
   a. Primer: Devflex 4020 Direct to Metal Primer; One (1) coat at minimum 2.2 mils dft. 43% to 45% solids; VOC 91 g/L.
   b. Finish: Ultra-HideDurus Exterior Acrylic Semi-Gloss #2416 Series; Two (2) coats at minimum 1.5 mils dft. 40% to 42% solids; VOC 79 g/L.

2.05 INTERIOR PAINT AND FINISH MATERIALS SCHEDULE

A. Apply paint and finish materials to substrate surfaces indicated. Apply touch-up prime coats in addition to shop-applied prime coats. Provide additional job site prime coats when indicated.

B. Metal – Ferrous: Shop Primed/Unprimed

1. SW
   a. Primer: DTM Acrylic Primer B66W1. 2.5 mils dft. 46% solids; 138 g/L.
   b. Finish: Harmony Low Odor Interior Latex Semi-Gloss B10 Series. Two (2) coats at minimum 1.6 mil dft per coat. 38% to 42% volume solids; VOC 0 g/L.
2. PPG
   a. Primer: Pitt-Tech Interior/Exterior Primer DTM Industrial Enamel 90-712 Series. One (1) coat at minimum 2.0 mils dft. 37% to 41% solids; VOC 116 g/L.

b. Finish: Pure Performance Interior Semi-Gloss Latex 9-500 Series. Two (2) coats at minimum 1.3 mil dft per coat. 35% to 39% volume solids; VOC 0 g/L.

3. ICI DULUX
   a. Primer: Devflex 4020. One (1) coat at minimum 2.2 mil dft. 42% to 45% solids; VOC 91 g/L.
   b. Finish: 1406 Lifemaster Semi-gloss 2000 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
4. Surfaces: Hollow metal doors, frames, door mullions, railings, ferrous metal surfaces.

C. Metal – Ferrous: Galvanized

1. SW
   a. Primer: DTM Acrylic Primer B66W1. 2.5 mils dft. 46% solids; 138 g/L.
   b. Finish: Harmony Low Odor Interior Latex Semi-Gloss B10 Series. Two (2) coats at minimum 1.6 mil dft per coat. 38% to 42% volume solids; VOC 0 g/L.
2. PPG
   a. Primer: Pitt-Tech Interior/Exterior Primer DTM Industrial Enamel 90-712 Series. One (1) coat at minimum 2.0 mils dft. 37% to 41% solids; VOC 116 g/L.
   b. Finish: Pure Performance Interior Semi-Gloss Latex 9-500 Series. Two (2) coats at minimum 1.3 mil dft per coat. 35% to 39% volume solids; VOC 0 g/L.
3. ICI DULUX
   a. Primer: Ultra Hide Aquacrylic Gripper 3210. One (1) coat at minimum 1.4 mil dft. 49% to 51% solids; VOC 95 g/L.
   b. Finish: 1406 Lifemaster Semi-gloss 2000 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
4. Surfaces: Hollow metal doors, frames, door mullions, railings, ferrous metal surfaces.

D. Gypsum Board and Plaster– Ceilings/Soffits

1. SW
   a. Primer: Harmony Low Odor Interior Latex Primer B11W900. One (1) coat at 1.3 mils dft. 31% to 35% volume solids; VOC 0g/L.
   b. Finish: Harmony Low Odor Interior Latex Flat B5 Series. Two (2) coats at minimum 1.7 mil dft per coat. 40% to 44% volume solids; VOC 0 g/L.
2. PPG
   a. Primer: Pure Performance Interior Latex Primer 9-900 Series. One (1) coat at 1.4 mil dft. 34% to 38% solids; VOC 0 g/L.
   b. Finish: Pure Performance Interior Flat Latex 9-100 Series. Two (2) coats at minimum 1.6 mil dft per coat. 38% to 42% volume solids; VOC 0 g/L.

3. ICI DULUX
   a. Primer: 1080 Lifemaster 2000. One (1) coat at 1.4 mil dft. 34% to 38% solids; VOC 0 g/L.
   b. Finish: 1402 Lifemaster Flat 2000 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
4. Surfaces: Ceilings, bulkheads

E. Gypsum Board - Walls

1. SW
   a. Primer: Harmony Low Odor Interior Latex Primer B11W900. One (1) coat at 1.3 mils dft. 31% to 35% volume solids; VOC 0 g/L.
   b. Finish: Harmony Low Odor Interior Latex Eg-Shell B9 Series. Two (2) coats at minimum 1.6 mil dft per coat. 37% to 41% volume solids; VOC 0 g/L.
2. PPG
   a. Primer: Pure Performance Interior Latex Primer 9-900 Series. One (1) coat at 1.4 mil dft. 34% to 38% solids; VOC 0 g/L.
   b. Finish: Pure Performance Interior Eggshell Latex 9-300 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
3. ICI DULUX
   a. Primer: 1080 Lifemaster 2000. One (1) coat at 1.4 mil dft. 34% to 38% solids; VOC 0 g/L.
   b. Finish: 1402 Lifemaster Eg-Shell 2000 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
4. Surfaces: Gypsum board wall surfaces.

F. Exposed Structure - Ferrous (Eg-Shel): Dryfall

1. SW
   a. Primer: ProCryl Universal Primer, B66-310 Series (2-4 mils dft)
   b. Finish: Waterborne Acrylic Dry Fall, B42W2 Two coats at minimum 4.5 mils dft.
2. PPG
   a. Primer: Pitt-Tech Int/Ext Primer Finish DTM Industrial Enamel 90-712 (2.0 to 3.0 mils dft).
   b. Finish: Speedhide Interior Super Tech WB Acrylic Dry Fog Latex, 6-725 two coats at minimum 2.5 mil dft per coat.
3. ICI DULUX
   a. Primer: Spraymaster Pro Uni-Grip WB Acrylic Dryfall Eggshell Primer and Finish; 1 coat at minimum 1.5 mil dft;VOC 26 g/L.
   b. Finish: Spraymaster Pro Uni-Grip WB Acrylic Dryfall Eggshell Primer and Finish; 2 coats at minimum 2.0 mils dft per coat;VOC 26 g/L.
4. Surfaces: Exposed metal decking, trusses, structural steel, metal joists.

G. Exposed Structure - Galvanized (Flat): Dryfall

1. SW
   a. Finish: Waterborne Acrylic Dry Fall, B42W2 Two coats at minimum 2.5 mils dft per coat.
2. PPG
   a. Finish: Speedhide Interior Super Tech WB Acrylic Dry Fog Latex, 6-725 two coats at minimum 2.5 mil dft per coat.
3. ICI DULUX
   a. Finish: Spraymaster Pro Uni-Grip WB Acrylic Dryfall Semi-Gloss Primer and Finish; 2 coats at minimum 2.5 mils dft per coat;VOC 39 g/L.
4. Surfaces: Exposed metal decking, trusses, structural steel.

H. Interior Stain Schedule - Wood Trim

1. SW
   a. Stain: Minwax 250 VOC Stains: Colors as selected by Architect.
   b. Finish: Two coats S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series at 1.0 mil dft per coat.
2. PPG
   a. Stain: 250 VOC Stains: Colors as selected by Architect.
   b. Finish: Two coats REX Interior Acrylic Polyurethane Satin Finish 77-49, VOC 236 gal/L at minimum 1.0 mil dft per coat.
3. ICI
   a. Stain: 250 VOC Stains: Colors as selected by Architect.
   b. Finish: Woodpride Interior Waterborne Aquacrylic Satin Varnish, VOC 174 g/L. Two coats.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrate surfaces and installation condition. Report condition(s) that might affect proper application.

B. Do not proceed with painting work until unsatisfactory conditions have been corrected.

C. Initial application of paint to a surface constitutes acceptance of existing conditions and responsibility for satisfactory performance.

D. Examine specification sections of other trades and their provisions regarding painting. Surfaces left unfinished shall be painted or finished as part of the work of this Section unless specifically noted otherwise.

3.02 SURFACE PREPARATION

A. General

1. Broom clean and remove excess dust before painting is started in any area.
2. Broom cleaning is not permitted after operations have begun in a specific area.
3. Surfaces shall be clean, dry and adequately protected from dampness.
4. Surfaces shall be free of any foreign materials that will adversely affect adhesion or appearance of applied coating.
5. Remove any mildew and neutralize the surface prior to applying coating.

B. Concrete

1. Remove splatters, dust and dirt by brushing or water washing with clear water.
2. Remove misplaced mortar.
3. Cracks, abrasions and other defects shall be cut out, patched flush, and sanded smooth and sealed before applying prime coat.

C. Wood - Stained

1. Prime and backprime faces, edges and end with first coat before installation.
2. Sandpaper to smooth and even surface, dust off.
3. Countersink nails.
4. Putty all nail holes, cracks, open joints and other defects with mixture of stain and putty so that appearance of completed work is uniform. Sand smooth and dust off.

D. Structural Steel and Miscellaneous Ferrous Metal

1. Bare Metal Surfaces
   a. Remove grease, oil, dirt and other foreign material prior to prime coat application where necessary according to SP-1, SP-2 and/or SP-3.
   b. Remove rust prior to prime coat application according to SP-11.
   c. Include all hangers and miscellaneous fabricated items.
2. Shop Primed Surfaces
   a. Fill open joints or abrasions in shop prime coat with filler; feather edges, sand smooth, and touch-up with primer compatible with shop primer. Extend primer beyond treated area.
   b. Remove grease, oil, dirt and other foreign material prior to prime coat touch-up where necessary according to SP-1, SP-2 and/or SP-3.
   c. Include all hangers and miscellaneous fabricated items.

E. Galvanized or Zinc-Coated Items

1. Pretreat surfaces prior to application of prime coat with phosphate pretreatment, unless prime coat material to be used is recommended by its manufacturer for direct application over zinc treated surfaces of the type at hand. Follow manufacturer's directions.

2. Remove dirt or grease on surfaces scheduled for paint finish according to SP-1. Wipe dry with clean cloths.
3. Roughen surface with steel wool as necessary to remove gloss.

F. Gypsum Board

1. Fill minor irregularities with spackling paste.
2. Sand to smooth level surface and dust off.
3. Avoid raising nap of paper.

G. Factory Primed Items: Verify compatibility between factory applied primer and finish painting system. If compatibility cannot be guaranteed, then provide barrier coat compatible with both finishes.

H. Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces: Solvent clean in accordance with SSPC SP 1 and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants.

3.03 APPLICATION

A. General

1. Apply all paint in strict accordance with the manufacturer's instructions. Data sheets take precedence over these specifications if more restrictive, except for the minimum DFT specified in the schedule.
2. Do not apply until preceding coat is dry to manufacturer's recommendations.
3. Do not apply to any surface unless it is thoroughly dry.
4. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes if moisture content of surface is greater than recommended by manufacturer.
5. Do not use material that has exceeded the pot life stated by the manufacturer.
6. Apply to the following workmanship requirements:
   a. Neat appearance of finished surfaces.
   b. Absence of ridges, sags, runs, drops, laps, unnecessary brush marks, holidays, air bubbles and excessive roller stipple.
   c. Thorough mixing of paint and limited use of thinners.
   d. Uniformity of film thickness.
   e. Proper drying time between coats.
   f. Protection of unpainted and finished surfaces.
7. Coverage and hide shall be complete. When color or undercoats show through final coat, recoat until the paint film is of uniform finish, color, appearance, and coverage, at no additional cost to Owner.
8. Edges of paint or finish adjoining other materials or colors shall be sharp and clean without overlapping.

B. Methods

1. Application may be by roller, brush, spray or other approved means.

2. When utilizing spraying, be careful not to use methods which will affect other trades work in adjacent areas.

C. Mixing

1. Mechanically mix before use.
2. Agitate during application as required.
3. Do not tint or shade in field unless permitted by Architect.

D. Thinning

1. Dilute only as required to achieve suitable application viscosity.
2. Use only type and amount recommended by manufacturer.

E. Approvals: Do not apply succeeding coat of paint until previous coat has been inspected and written approval is given.

F. Electrical Conduits

1. Do not paint any electrical conduit or boxes unless they are exposed and abutting a surface that is to be painted or stained.
2. Conduits and boxes to be painted shall be given a coat of galvanizing pretreatment followed by the paint system for the adjoining surface.

G. Protection of Surfaces

1. Provide covers, drop cloths and masking to protect unpainted surfaces previously finish painted. Use special care in protecting electrical and mechanical items which may be damaged by the painting operations (i.e., overspray and solvents that might damage the internals of the item).
2. If possible, remove items not to be painted such as hardware, accessories, electrical plates, lighting fixtures and/or trim, mechanical grilles and louvers and similar items in contact with painted surfaces.
3. Use caution when painting exterior work to avoid wind carrying overspray, drippings, etc., onto adjacent structures, facilities and vehicles.
4. Following completion of painting, reinstall removed items by workmen skilled in the trade involved and remove all covers, masking and drop cloths.

END OF SECTION

SECTION 10 14 10

INTERIOR SIGNAGE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work includes:

1. Room numbers.
2. Room identification.
3. Restrooms
   a. Wheel Chair Accessible
   b. Non-Accessible
4. Directional/Informational signs.
5. Emergency escape directories.
6. Posted occupancy limit.

B. All signs which identify permanent facilities/accommodations shall be tactile and braille and limited minimally to room numbers, restrooms, floor identification and room names as deemed appropriate by the Owner.

1.02 SUBMITTALS

A. Shop Drawings: Submit manufacturer's product data, where applicable, and complete drawings showing all identifying devices and installation details in accordance with the requirements of the General Conditions.

B. Samples: Submit samples for materials, finishes, colors, letter styles, etc., as required for selection and approval by Architect prior to fabrication of identifying devices.

C. Final signage schedule must be approved by Owner prior to fabrication. Submittal to Owner should be made through the Architect.

1.03 QUALITY ASSURANCE

A. Signage Standards: Conform to the Americans with Disabilities Act (ADA) Standards where applicable and to the extent as indicated.

B. Acceptable Manufacturers: All units are to be custom fabricated; manufacturer's products meeting the specifications will be acceptable. Manufacturers must be regularly engaged in fabrication and installation of signage units and related identifying devices.

1. Fabricator shall make at least one visit to the site before production begins to review all sign locations and installation conditions with Architect and Owner's representative.

2. Fabricator must review all dimensional changes with Architect.

C. Approvals: All identifying devices shall be approved at the fabricator's shop by the Architect prior to shipment and installation.

D. Spelling and Braille Accuracy: Responsibility of sign manufacturer.

E. The Owner has the right to renumber the room numbers during construction. Manufacturer must not begin fabrication of room number plates until room numbers have been approved by the Owner, in writing, through the Architect.

F. Room identifications will be provided to the Contractor by the Owner during construction.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original shipping cartons with seals unbroken.

B. Protect materials from physical damage.

C. Store materials in clean, dry area.

D. Inspect all materials prior to installation to assure proper function and condition of all items.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Locations, Quantities, Graphics and Copy: As indicated on drawings and/or specified (scheduled) herein.

2.02 MATERIALS

A. Plates: High pressure phenolic "ES" plastic; scratch resistant, non-static, thermoset, rated self-extinguishing.

1. Colors: As selected by Architect.
2. Thickness: 3/32" for ADA plates; 1/16" for non-raised copy (flat) plates.

B. Changeable Copy: Provide 3/32" thick plastic back-up plate laminated to back of face plate to create slot for removable nameplates.

C. Provide an integral method to create tactile and Braille signs; producing a unitary component. Glued on or laminated letters or Braille cells are not acceptable.

2.03 DESIGN GUIDELINES

A. Plate Shape: Square cornered; do not bevel edges.

B. Letter Style

1. ADA Signs: Helvetica medium, all capital letters.
2. All Other Signs: Helvetica medium, mixed upper and lower case.

C. Tactile Letters and Braille: Grade II braille; raised 1/32" above background surface. Provide Braille dome topped same color as background. Sign manufacturer shall be responsible for verifying accuracy of spelling, both tactile and Braille.

D. Letter Size

1. Tactile Signs: Minimum letter size is 5/8" for capital letters. Room numbers to be 1".
2. Non-tactile Signs: Between 3/8" and 1" capital letter height. Larger letters are permitted on directional signs or on signs where reading distance is greater than 15'-0".
3. Overhead Signs: Minimum 3" copy. Mixed upper and lower case is permissible. Non-tactile is permissible.

2.04 METHOD OF MANUFACTURING

A. Tactile Signs: Relief engraved plates.

B. Non-Tactile Signs: Routed engraved.

2.05 SIGNS REQUIRED FOR TACTILE/BRAILLE

A. Room Numbers: 2-1/4" x 6-3/4" plate with 1" numerals centered horizontally on plate with Braille directly below numerals.

B. Room Identification: This sign is in addition to Room Number specified in 2.05A.

1. Size determined by copy requirements, laid out flush left with 3/4" margin on left, room name in 5/8" caps with Braille directly below type copy, all flush left.

C. Restrooms - Wheel Chair Accessible: Approximately 6” wide x 8” high plate with 1" capital letters (MEN or WOMEN), centered on the plate with Braille centered directly below the word. Provide a routed engraved wheel chair access symbol and a universal man or woman symbol located above the word. No border.

D. Restrooms - Non-Accessible: Two plates required.

1. 6-3/4" wide by 3-3/4" high plate with 1" room number centered horizontally on plate with braille centered directly below numerals. "Men" and "Women" will appear in 3/4 inch capital letters, centered horizontally on the plate with Braille centered directly below the word.
2. 6-3/4" x 6-3/4" plate with 5/8" raised caps informing location of nearest accessible restroom. Same message in Braille centered below copy.

E. Directional/Informational Signs: Wall mounted; non-tactile; in upper and lower case. Letter height shall be at least 1" cap height for directional signs. Letter sizes for informational signs may be less than 1".

2.06 SIGNS REQUIRED FOR NON-TACTILE/BRAILLE SIGNAGE

A. Plate Shape: Square cornered; do not bevel edges.

B. Plate Heights

1. 2-1/4" for one line of copy.
2. 3-3/4" for two lines of copy.
3. 5-1/4" for three lines of copy.

C. Changeable Copy Plates

1. Height: Same as in "B" above.
2. Length: 7-1/2"
3. Face openings of slot: 1" high with 3/4" margin at ends and bottom.
4. Allow 1/2" vertically between slot openings.
5. Slots behind openings: Allow for 1-1/4" wide x 1/16" thick blank changeable copy strips supplied by the Contractor for future engraving by Owner.
6. Tactile room numbers with Braille may appear on the face of the sign frame.

2.07 EMERGENCY ESCAPE DIRECTORY

A. Description: 18" x 12". Extruded aluminum "F" frame with anodized medium bronze finish and non-glare acrylic face. Provide with rigid masonite backing.

B. Copy: Color screen printed removable graphic of floor plan showing escape route from installed location. Locate at building main entrance and primary exits.

2.08 POSTED OCCUPANCY LIMIT

A. Posted Occupancy Limit: Provide sign reading, "Maximum Occupants Permitted This Space". Provide signage in accordance with OBC 1003.2.2.5 “Posting of Occupant Load”. Locate signs in the indoor practice field.

2.09 COPY POSITION

A. Lines of copy laid out flush left with a margin of 3/4" along the left edge of plate. Exceptions are small room numbers and restrooms shall be centered on the plate.

B. Left hand, right hand and bottom margins are 3/4". Vertical spacing measured between lower case letters is 3/4". Overall width and height of a plate is achieved with multiples of 3/4".

C. Locate directional arrows in upper left hand corner of plate. Arrows count as one line of copy.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mount signs plumb and level.

B. Mount all identification devices with 3/4" foam tape on all four edges.

3.02 SIGNAGE SCHEDULE

A. Provide the following Sign Plates

1. Room Identification Signs: For bidding purposes, provide 9 room identification signs. Each sign will contain 20 symbols/characters arranged in two lines.
2. Women, combined with room number and handicap symbol and international symbol, as applicable, at each restroom.
3. Men, combined with room number and handicap symbol and international symbol, as applicable, at each restroom.

B. Provide room numbers at all door locations.

C. Emergency Escape Directory: As specified hereinbefore.

D. Directional/Informational Signs: For bidding purposes, provide one per lobby and in the practice area. Each sign will contain 25 symbols/characters arranged in two lines. Locate as directed by Architect.

E. Posted Occupancy Limit: As specified hereinbefore.

F. Sign Locations

1. Single Doors: Locate signs on the wall next to the latch side of the door, 1" from the outside edge of the door frame and with the top edge of the uppermost sign 61-1/2" A.F.F.
2. Pairs of Doors: Locate signs as specified above for single doors, except Architect will direct in field if sign occurs on right or left jamb of opening.
3. Doors with Borrowed Lights: Locate as directed by Architect.

3.03 CLEAN UP

A. After completion of work remove all debris and tools from the premises, clean all adhesive spatter and run-over from finished surfaces and wash all plated clean of fingermarks and soil. Polish sign surfaces with a soft cotton rag.

END OF SECTION

SECTION 10 22 26

FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide sound insulated, manually operated, folding, flat panel operable walls as indicated, complete including required fasteners, fittings and accessories.

1.02 QUALITY ASSURANCE

A. Installer: Factory trained personnel regularly engaged in installation and maintenance of the specified operable wall.

B. Guaranty: Manufacturer shall provide 2 year guaranty covering workmanship, materials, installation and operation.

1.03 SUBMITTALS

A. Shop Drawings: Submit product data and layout drawings in accordance with the General Conditions and Section 01 33 23.

B. Samples: Submit samples of panel finish for selection by Architect.

C. Operation and Maintenance Manuals: Submit manuals and special tools in accordance with Section 01 78 21.

PART 2 PRODUCTS

2.01 FOLDING PARTITIONS

A. Manufacturer: Drawings and specifications are based on MODERNFOLD Acoustic-Seal 933. Equal products by EMCO; HUFCOR; KWIK-WALL and PANELFOLD are acceptable providing they meet or exceed the requirements specified herein.

B. Operation: Consists of a series of continuously hinged , manually operated, flat steel panels, top supported with operable floor seals.

1. Final closure accomplished by expanding jamb from panel edge or hinged panel as required by each door condition (i.e. partitions with pocket doors require expanding jamb).

C. Panel Construction

1. Size: 3 inches thick in manufacturer's standard widths.
2. Panel Skins: 21 gage steel.
3. Core (Frame): 16 gage steel.
4. Top Channel Assembly: Reinforced to support suspension components.
5. "Wrap-around" skin/panel construction shall, with astragal seals, provide a minimum "groove" appearance at the vertical panel joints.
6. Weight: Approximately 10 pounds per square foot (average hanging).

D. Panel Finish: Factory applied, Class 1 rated material, as per OBC with flame spread 0-25 as determined by ASTM E84.

1. Provide reinforced vinyl with woven backing weighing not less than 30 ounces per linear yard. Color and pattern as selected by Architect.

E. Sound Seals

1. Vertical Seals Between Panels: Tongue and groove configuration astragals incorporating vinyl acoustical seals.
2. Horizontal Top Seals: Continuous contact extruded vinyl.
3. Manual Floor Seals: Designed to provide minimum 1 inch nominal operating clearance; activated by a removable handle. Seals on each panel shall be activated simultaneously.

F. Suspension System: Continuous "C" channel shape steel track, supported by adjustable steel brackets connected to structural supports with threaded rods.

1. Panels supported by ball-bearing, steel wheel trolley assemblies.

G. Laboratory Acoustical Performance - tested in accordance with ASTM E90: STC rating of no less than 49. Provide written test results on request.

2.02 POCKET DOOR

A. Manufacturer: Drawings and specifications are based on MODERNFOLD Stowaway Type II. Equal products by other acceptable manufacturers listed in 2.01A are acceptable providing they meet or exceed the requirements specified herein.

B. Door Construction

1. Size: Nominal 2.75 inches thick in equal widths to close opening.
2. Panel Skins: Class A Flame Spread Rated moisture resistant gypsum board.
3. Core (Frame): Extruded aluminum.
4. Top Channel Assembly: Reinforced to support suspension components.
5. Sound Seals: Gasketed astragal seals in vertical edges and jambs; fixed sweeps on horizontal edges.

6. Weight: Approximately 8 pounds per square foot (average hanging).
7. Hinges: Type and quantity as recommended by manufacturer for door height and weight.
   a. Finish: US26D.
8. Provide manufacturers standard latching type hardware.

C. Door Panel Finish: Wood veneer. White oak finished to match wood doors specified in Section 08 14 00. Field finished, see Section 09 91 00.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that openings have been completely prepared in accordance with manufacturer's requirements. Notify Architect of conditions detrimental to operable wall installation and operation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

END OF SECTION

SECTION 11 52 13

PROJECTION SCREENS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide motor operated, above ceiling mount front projection screen complete with all controls, mounting brackets and hardware.

B. Provide manually operated, wall mount front projection screen complete with all mounting brackets and hardware.

1.02 RELATED SECTIONS

A. Electrical: Division 26.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data in accordance with the requirements of the General Conditions and Section 01 33 23.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery items in manufacturer's original protective packaging.

B. Store items in original packaging to prevent soiling and physical damage.

C. Handle so as to prevent damage to finished surface.

PART 2 PRODUCTS

2.01 PROJECTION SCREENS

A. Motor Operated Projection Screen

1. Type: Motor operated, remote controlled, recessed ceiling mounted.
2. Screen: Flame retardant and mildew resistant, mat white with black masking borders. Vertical seams permitted at minimum 6' on center. HDTV 16:9 format.
   a. Provide extra drop length of dimension indicated to comply with the following requirements for fabric color and location of drop length:
      1) Color: Black.
      2) Location: At top of screen.

3) Provide drop length as required for bottom of screen to be set 3' above floor. Coordinate each screen with ceiling/screen mounting height

3. Sizes: As indicated on schedule contained herein.
4. Doors: Independently motorized. Field finished to match ceiling.
5. Motor: 3-wire quick reversal type; ball bearing with automatic overload cut-off and integral interlocking gears.
   a. Power: 115V, 60 Hz, 3.5 amp.
   b. Controls: Key operated 3-position switch ("UP", "OFF", "DOWN").
   c. Provide with pre-set but accessible limit switches to automatically stop screen fabric in the up and down position. Provide positive stop action.
6. Case: Extruded aluminum back, top and front with stamped steel end caps.
7. Mounting Brackets: Provide ceiling mount type brackets of quantity as required by manufacturer.
8. Manufacturer: Signature Series V Motorized Screen with M1300 Viewing Surface by DRAPER or equal by DA-LITE SCREEN COMPANY, BRETFORD/KNOX MANUFACTURING.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install screens in neat, plumb, true alignment in locations indicated on drawings and as detailed. Comply with written installation instructions of screen manufacturer.

B. Coordinate above ceiling mount with ceiling grid layout.

END OF SECTION

SECTION 11 66 26

WALL PADDING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide labor, materials and accessories necessary to install wall padding as specified herein and indicated on drawings.

1.02 SUBMITTALS

A. Submit manufacturer's product data and installation instructions.

B. Shop Drawings: Submit wall padding layout.

1.03 QUALITY ASSURANCE

A. Conform to current code requirements for flame spread and smoke development.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturer: PORTER; AMERICAN ATHLETIC INC.; PROMATS; INSTITUTIONAL PRODUCTS, INC. (IPI), BPI or equal.

B. Description: Panels consisting of 3/8" CDX plywood back, bonded to 1-1/2" polyurethane foam core and 14 oz. vinyl coated nylon facing.

C. Sizes: As indicated on drawings.

D. Color: As selected by Architect.

E. Attachment Clips: “Z” clips mounted on wall and panel for concealed attachment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions. Securely fix wall panels by means of Z-clips attached to wall. Engage panel mounted Z-clips into wall mounted clips. No visible fasteners permitted.

END OF SECTION

SECTION 12 33 55

PLASTIC LAMINATE FACED CASEWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide plastic laminate casework as indicated on drawings.

B. Work includes fabrication and installation of standard base and wall cabinet components, shelving, fillers, panels and other units as indicated.

C. Accessories common to casework are included as work of this section.

D. Related Work Specified in Other Sections
1. Wood Blocking: Section 06 10 00.
2. Countertops: Section 06 61 17.
3. Vinyl Base: Section 09 65 00.

1.02 QUALITY ASSURANCE

A. Fabricator qualifications: A firm specializing in the fabrication of millwork with a satisfactory record of performance on projects of comparable size and quality. Fabricator shall be acceptable to the Architect.

B. Installation: Performed only by experienced skilled finish carpenters.

C. Catalog Standards
1. Manufacturer's catalog numbers, where shown, are for convenience in identifying cabinet work.
2. Use of a specific manufacturer's catalog numbers is not to preclude the use of any other acceptable manufacturer's product or procedures that may be equivalent.

D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard:
1. ANSI: American National Standards Institute.
2. AWI: Architectural Woodwork Institute.
3. NEMA: National Electrical Manufacturer's Association.
4. ASTM: American Society for Testing and Materials.
5. CS: Commercial Standard.

E. Quality Grade: Materials and fabrication shall be "custom grade" in accordance with "Quality Standard Illustrated," of the AWI conforming to the following sections:
1. Section 200: Plywood and particleboard.
2. Section 400: Casework.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's/fabricator's data and installation instructions for each type of casework unit.

B. Samples: Submit samples of specified finishes.

C. Shop Drawings
1. Submit shop drawings for casework showing plans, elevations, ends and cross sections.
2. Show details and location of anchorages and fitting to floors, walls and base.
3. Include layout of units with relation to surrounding walls, doors, windows and other building components.

1.04 DELIVERY, STORAGE AND HANDLING

A. Protect casework during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver casework until concrete, masonry and other similar wet work has been completed and is thoroughly dry, outside door openings are permanently watertight, exterior windows are glazed and, in case of temperature dropping below 60 degrees F., until temporary heating and ventilating systems are in operation.

C. Store casework in dry, well-ventilated spaces with constant minimum temperature of 60 degrees F., and maximum relative humidity of 55%.

1.05 PROJECT CONDITIONS

A. Provide and maintain a constant temperature and humidity before, during and after installation as required to maintain optimum moisture content of installed materials.

B. Obtain measurements and verify dimensions and details before proceeding with finish carpentry.

1.06 WARRANTY

A. Plastic laminate faced casework to be guaranteed by manufacturer, and Contractor jointly and severally to the Owner for three years, to be free of defects due to faulty materials, workmanship, or performance.

B. Warranty not to include damage sustained as a result of abuse, negligence, use beyond that of it's intended function by the Owner, acts of God, or unnatural events or causes beyond the control of the manufacturer.

C. Include repair and replacement of defective materials and components at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Products of the following manufacturers meeting or exceeding the standards specified herein are acceptable:
   1. STEVENS INDUSTRIES, INC.
   2. LSI CORPORATION
   3. TMI SYSTEMS DESIGN CORPORATION
   4. MFI, MERCHANDISE FIXTURES, INC.

2.02 MATERIALS

A. Particle Board (Substrate for Laminate Surfaces): High density industrial grade with a minimum density of 45 pounds per cubic foot and a moisture content between 9% maximum and 6% minimum, meeting or exceeding ANSI A208.1 Grade M-3 or ASTM D1037.

B. Fiberboard: Uniform, medium density conforming to ANSI A208.2. Maximum moisture content of 8%. Meet the following minimum standards:
   1. Internal Bond: 125 psi.
   2. Modulus of Rupture: 4,000 psi.
   3. Modulus of Elasticity: 400,000 psi.
   4. Screw Holding Power: 325 pounds.
   5. Density: Minimum 50 pounds per cubic foot.

C. Hardboard: Tempered, smooth both sides; conforming to ANSI/AHA A135.4 Class 1.

D. Lumber: Optional framing material for concealed framing. Conform to AWI requirements premium grade; provide in suitable species of manufacturer's option.

E. Plastic Laminate: Conform to the requirements of the National Electrical Manufacturer's Association (NEMA) Publication Number LD-3. Plastic laminate shall be WILSONART, FORMICA, PIONITE, or NEVAMAR. Colors, patterns and finishes shall be as selected by Architect from the manufacturer's full range of standard colors, patterns and finishes. Manufacturer, finish and color to match plastic laminate specified in Section 06400.
   1. General Purpose Horizontal Grade: 0.05 inches thick.
   2. General Purpose Vertical Grade: 0.028 inches thick.
   3. Backing Sheet Grade: 0.02 inches thick.
   4. Post-Forming Grade: 0.042 inches thick.
   5. Cabinet Liner: 0.02 inches thick.
   6. Fill and seal plastic laminate joints with Seamfil by KAMPEL ENTERPRISES, INC. or FormFill by FORMFILL PRODUCTS (UNIKA USA). Colors specifically mixed by manufacturer to match plastic laminate.

F. Pressure Fused Laminate/Interior Surfacing

1. Melamine resin impregnated, 100 gram PSM minimum, surface laminated to core under pressure.
2. Meet NEMA LD3.1-1991 GP28 standards and NEMA LD3-1991 CL20 standards.
3. White pressure fused laminate for cabinet interiors behind door and drawers, interiors of all open cabinets unless otherwise specified, and underside of wall cabinet unless otherwise specified.
4. Shall be balanced at all concealed surfaces with phenolic backer. Unsurfaced coreboard not allowed.

G. Hardware Items: All exposed hardware to be polished stainless steel finish.
1. Drawer Slides: Self-closing, side mounting type with nylon tire, steel ball-bearing rollers. Manufactured by BLUM, GRASS, AMEROCK, KNAPE & VOGT; ACCURIDE. Load capacity as follows:
   a. 75 pounds: Drawers up to 3-1/2 inches deep: Similar to ACCURIDE Series 2132.
   b. 100 pounds: Drawers up to 8 inches deep: Similar to ACCURIDE Series 2832.
   c. 150 pounds: Drawers over 8 inches deep, all file drawers: Similar to ACCURIDE Series 4034.
2. Drawer and Door locks: 5-pin tumbler removable core, dead bolt. BEST; NATIONAL LOCK; CORBIN. Key and masterkey locks as directed by Associate Architect. Provide 2 keys per cylinder and 5 masterkeys per master set.
3. Concealed Hinges: European style, self-closing, type as required for construction. Metallamet by HAFELE; similar by GRASS; PRAMETE; BLUM.
4. Continuous Hinge: 780 HD Roton Hinge by HAGER. Aluminum with finish as selected by Architect.
5. Drawer and Door Pulls: Wire pull, 5/16" diameter x 3-1/3" long x 1-5/16" extension. STANLEY, GRASS; BLUM, HAFELE.
6. Adjustable Cabinet Shelf Supports: Provide metal pilaster type or hardwood drilled type, manufacturer's standard.
   a. Metal Type: KNAPE & VOGT (KV) steel nickel plated.
      1) Standards: KV #255 NP for dado installation.
      2) Clips: KV #256 NP.
   b. Wood Type: Provide hardwood verticals with adjustment holes located 1/2" on center. Provide shelf clips of type that locks shelf in place.
7. Catches: Magnetic, STANLEY #45 or equal by NATIONAL LOCK or EPCO.

H. Glue: Waterproof adhesive (phenol, resorcinol or melamine) base meeting requirements of CS 253 for "Wet Use" unless otherwise specified in specific sections.

I. Plywood: Birch hardwood plywood conforming to AWI Section 200 for veneer core material, AWI "custom" grade, provide with waterproof glue.

2.03 FABRICATION - CASEWORK

A. General: Except as specified hereinafter, fabricate all work in accordance with AWI

quality standards as specified. Work not specified with a level of quality shall be not less than Custom quality per AWI.

1. Provide complete factory-fabricated and finished components which, when assembled on site, will provide an integral system of storage and work surfaces.
2. Provide locks where indicated.
3. Make cut-outs and other provisions for the work of other trades and as indicated or required for installation.
4. Assemble cabinets with accurate router grooves 1/8" deep with glue and nails and screws.
5. Apply plastic laminate to exposed ends after assembly to conceal screws in end cabinet.
6. All particle board panels to be balanced construction.

B. Subbases: Provide continuous plywood closed bases capable of being leveled to meet site conditions; subbase to be unfinished to receive resilient base. See Section 09650.

C. Base Cabinets

1. Sides and Bottoms: Construct of 3/4" thick particle board with interior of cabinet finished with cabinet liner or polyester laminate. Provide balanced constructed panels with neutral colored backer sheet at concealed conditions and finish laminate at exposed conditions.
2. Backs: Standard 1/4" prefinished hardboard. Install in housed joints in surrounding panels. All backs exposed to view to be neutral colored except where indicated to match vertical color surfaces.
   Rear, unexposed side of backs to receive continuous hot melt glue at joint between back and sides/top/bottom for sealing against moisture and vermin, and to further contribute to cabinet stability.
3. Frame: Provide frame construction of 3/4" thick particle board or lumber dadoed into sides at the following:
   a. As sub-top.
   b. At all locked drawers and doors.
4. Runners: Provide runners or frame construction between all drawers.
5. Shelves: Provide fixed and adjustable shelves with particle board core where indicated on drawings. Provide shelves adjustable on 1/2" centers. Except for exposed shelving conditions, finish shelves with neutral colored polyester laminate or liner grade laminate. Finish front and rear edges with PVC "T" edge.
   a. Shelves under 36" wide: 3/4" thick, except all open shelves to be 1" thick.
   b. Shelves 36" to 42" wide: 1" thick.
   c. Shelves over 42" wide: Construct in accordance with AWI Section 400 to support minimum 30 lbs./running foot of shelf with deflection limited to 1/4" or provide intermediate supports to limit the span to ranges specified above.
6. Finish
   a. Casework Edges: Except where cabinet design requires matching laminate edges and/or "T" edge, finish front edges of sides, frames,

and bottom with PVC sheet, black, gray or neutral colored as approved by Architect.

b. Exposed Exterior of Casework: Finish exposed portion of cabinet with vertical grade plastic laminate in solid color finish as selected by Architect.

c. Interior of Casework

1) Semi-Concealed (behind doors): Neutral colored polyester or cabinet liner laminate.

2) Exposed: Vertical grade laminate to match exposed casework.

d. Shelves: Same as specified for interior of casework. "T" edge typical except where cabinet design requires matching laminate self edge.

D. Drawers

1. Body: Construct of fiberboard with polyester laminate finish on faces and PVC on exposed top edges. Subfronts, sides and back fabricated with shouldered lock joint or dado construction and routed to receive bottom.
   a. Sides and Back: 1/2" thick.
   b. Subfront: 5/8" thick.
2. Bottom: 1/4" thick prefinished hardboard, housed and glued, into front, sides and back. Underside of drawer to receive continuous hot melt glue at joint between bottom and back/sides/front for sealing and rigidity. Reinforce drawer bottoms as required with intermediate spreaders.
3. Front: 3/4" thick particle board front finished with vertical grade plastic laminate on exposed face and cabinet liner laminate on interior side; total thickness 13/16" thick. Except where cabinet design requires self edge matching laminate edges (see cabinet design), edges to be finished with PVC "T" edging, black, gray or neutral color as selected by Architect; corners rounded.
   a. Where adjacent door sizes require core thickness in excess of 3/4", provide drawer fronts to match door thickness. Verify conditions with Architect.
4. Install on proper sized slides specified herein.

E. Doors: Construct and finish same as drawer fronts except core construction to vary as follows:

1. Doors over 30" x 48": Construct from 1" to 1-1/4" thick particle board core.
2. Doors over 36" x 60": Construct as 1-3/8" thick hollow core units in accordance with AWI Section 1300.

F. Wall Cabinets: Construct and finish same as base cabinets except provide suitable hang rail of 3/4" plywood secured to cabinet frame.

1. Where wall cabinets close to soffit or ceiling, provide fascia scribed to conditions and leveled on bottom to permit level installation of cabinets. Finish of fascia to match cabinet.

G. Design

1. Configuration of casework is indicated on drawings.
2. The detailing and design required to provide rigid, solid and structurally

adequate casework is the responsibility of the fabricator; within parameters of AWI specifications and as approved by Architect.

3. The following conditions require special attention:
   a. Casework exceeding 42" in width between supports.
   b. Sink and/or equipment cutouts and supports.
   c. Countertops exceeding 24" unsupported.
   d. Wall and Ceiling Mounted Casework: Provide integral framing in casework of size, strength, and in locations which allow unit to be screw attached to proper substrate and remain rigidly in place.

PART 3 EXECUTION

3.01 CASEWORK INSTALLATION

A. General
1. Install plumb, level, true and straight with no distortions so that doors and drawers will fit openings properly and be accurately aligned.
2. Shim as required using concealed shims.
3. Where casework abuts other finished work, scribe and apply filler strips for accurate fit with concealed fasteners.
4. Where possible, assemble units into one integral unit with joints flush, tight and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16".
5. Anchor cabinet units securely in place with concealed (when doors and drawers are closed) fasteners, anchored into structural support members of wall construction. Comply with manufacturer's instructions and recommendations for support of unit.
6. Adjust casework and hardware so that doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

B. Base Cabinets
1. Fasten each individual cabinet to floor at toe space, with fasteners spaced at 24" on center.
2. Bolt continuous cabinets together.
3. Secure individual cabinets with not less than 2 fasteners into floor, where they do not adjoin other cabinets.

C. Wall Cabinets
1. Verify that wood blocking has been installed at required locations.
2. Bolt continuous cabinets together.
3. Secure individual cabinets with not less than 2 fasteners into wall (wood blocking), where they do not adjoin other cabinets.

3.02 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.

1. Patch surfaces damaged by installation to prior condition as approved or replace damaged units as directed.

B. Clean shop-finished surfaces, touch-up as required, and remove or refinish damaged or soiled areas, as acceptable to Architect.
   1. Dust cabinet interiors. Clean exterior surfaces to original condition.

C. Advise Contractor of procedures and precautions for protection of materials and installed casework from damage by work of other trades.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Common work results for requirements specifically applicable to Division 22.

B. Requirements of Division 01 Specifications, General Provisions of the Contract and General and Supplementary Conditions apply to this Division.

1.02 REFERENCES

A. AGA: American Gas Association

B. ANSI: American National Standards Institute

C. ASME: American Society for Mechanical Engineers

D. ASTM: American Society for Testing and Materials

E. AWWA: American Water Works Association

F. MSS: Manufacturer's Standardization Society of the Valve and Fitting Industry

G. NEMA: National Electrical Manufacturers' Association

H. NFPA: National Fire Protection Association

I. UL: Underwriters' Laboratories, Inc.

1.03 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01 including required number of copies.

B. Include Products as specified in the individual sections of Division 22.

C. Group submittals to include complete information of related systems, products, and accessories in a single submittal.

D. Prepare shop drawings completely independent of the Engineer of Record's CADD files. Should the Contractor or Vendor wish to use the Engineer of Record's CADD files as the basis for developing their shop drawings, a release form, obtainable from the Engineer or Architect, must be signed and a nominal charge of $30.00 per sheet must be made payable to the engineering firm to cover the cost of preparing the drawings for use by others.

E. Assist in the preparation of coordinated room layouts as specified in Division 01 and Section 23 05 00. Include coordination of concrete pads and foundations including anchor bolt and sleeve locations.

F. Submit copies of shop drawings in accordance with Division 01, for plumbing equipment and piping systems.

G. Brochures: Submit manufacturer's product data and brochures including:
   1. Complete descriptions
   2. Illustrations
   3. Rating data, accessories, dimensional data, and applicable options and features marked for the specific items scheduled on drawings and specified herein
   4. Capacities stated in the terms specified
   5. Performance and rating data for plumbing equipment.

1.04 REGULATORY REQUIREMENTS

A. Perform Work specified in Division 22 in accordance with standards listed below of the latest applicable edition adopted by the authority having jurisdiction. Where these Specifications are more stringent, they shall take precedence. In case of conflict, obtain a decision from the Architect.
   1. NFPA 54: National Fuel and Gas Code
   2. NFPA 101: Life Safety Code
   3. ANSI Handicapped Code-A117.1
   4. U.L. Fire Resistance Index
   5. ASTM E814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops
   6. IBC: International Building Code, with Mechanical and Plumbing Codes
   7. Special regulations, supplement, and amendments of the State and/or local authorities having jurisdiction.

B. Comply with the applicable edition date of each regulation as adopted by the authorities having jurisdiction.

1.05 PROJECT/SITE CONDITIONS

A. Layouts indicated on drawings are diagrammatical and intended to show relative positions and arrangement of piping and equipment. Coordinate work with other trades and with measurements obtained at the job site, as applicable, prior to installation. Generally, install work in locations shown on Drawings. Provide necessary, rises, drops, and offsets to fit in the available space unless prevented by Project conditions.

B. If prevented by project conditions, prepare drawings showing proposed rearrangement of Work, including changes to Work specified in other sections. Obtain permission of Architect before proceeding.

C. Place anchors, sleeves, and supports prior to pouring concrete or installation of masonry work.

D. Determine sizes and verify locations of existing utilities on or near site.

E. Keep roads and other spaces clear of materials and debris.

F. Visit site and be informed of conditions under which Work must be performed.

G. Locate equipment requiring periodic servicing so that it is readily accessible. Provide means of service access, following appropriate manufacturer's recommended service clearance space or, as applicable, means of access using duct, wall, or ceiling access doors.

H. Install piping to leave sufficient space for AHJ inspection of wall construction. Coordinate pipe routing with other trades including but not limited to Division 21, 23, 26 and 28.

1.06 FEES AND PERMITS

A. Obtain and pay for all necessary permits and inspection fees required to perform Division 22 work.

1.07 COORDINATION DRAWINGS

A. Prior to commencement of installation, assist in preparation of coordination drawings for work under this Division, as specified in Division 01. Fully cooperate with persons coordinating and performing work under other Divisions.

B. Drawings shall not be formally submitted but shall be kept on site for reference. Notify Architect of conflicts that cannot be resolved.

1.08 COMPLETENESS OF WORK

A. The Contract Documents depict plumbing systems which are intended to be complete and functioning systems. All products, materials, and labor necessary to render a fully functional system to fulfill the design intent shown on the documents shall be provided by the Contractor.

B. Catalog numbers referenced throughout the Division 22 Drawings and Specifications are intended to convey a general understanding of the type and quality of the product required. Where written descriptions differ from information conveyed by a catalog number, the written description shall govern. No extra shall be allowed because a catalog number is found to be incomplete or obsolete.

1.09 REFERENCE STANDARDS AND DEFINITIONS

A. Comply with provisions of Division 01.

1.10 PRODUCT SUBSTITUTIONS

A. Comply with provisions of Division 01.

1.11 RECORD DRAWINGS

A. Provide record drawings that illustrate the work of Division 22 as finally constructed. Deliver record drawings to the Architect in a form suitable for production.

B. Record drawings shall reflect all changes made to the Contract Documents, whether generated by addenda, change orders, or field conditions. Maintain a daily record of these changes and keep current set of drawings showing these changes.

C. Deliver record drawings to Architect within 30 days of Substantial Completion.

1.12 OWNING AND OPERATING MANUALS

A. Comply with the requirements of Division 01, but provide a minimum of three sets.

B. Manuals shall include clear and comprehensive instructions with appropriate graphics and project specific marked data to enable owner to operate and maintain all systems specified in this Division.

C. Copies of reviewed submittals on furnished shall be included.

PART 2 PRODUCTS

2.01 EQUIPMENT SUPPORTS

A. Structural steel for supports: ASTM A36.
   1. Use galvanized members installed in areas of high humidity or condensation, and outside.
   2. Furnish other members with shop coat of red primer.
   3. Retouch primer after field welding.

2.02 FLASHINGS AND COUNTERFLASHINGS

A. Furnish materials and coordinate installation for flashing and counterflashing roof penetrations for vents, pipe, drains, and ducts.

B. Materials:
   1. Sheetmetal: 24 gauge minimum ASTM A525, Class G90
   2. Sheet lead: 3 pounds per square foot
   3. Stainless steel: Minimum 20 gauge
   4. Sheet copper: 24 OZ/SF
   5. Vent Stack Fitting: Josam 1830 or Jay R. Smith 1750

2.03 WALL AND CEILING ACCESS PANELS

A. Style and type as required for material in which installed.

B. Size: 24"x24" minimum, as indicated, or as required to allow inspection, service and removal of items served.

C. 14 gauge minimum sheet metal for doors, 16 gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction.

D. Panels shall have spring hinges with screwdriver locks in non-public areas. Key lock, keyed alike, for panels in public areas.

E. Prime painted or rust inhibitive paint finish.

F. UL labeled when in fire-rated construction, 1-1/2 hour rating.

G. Provide in walls, floors, and ceilings to permit access to all equipment and piping requiring service or adjustment. Examples of such equipment needing access are valves, and equipment needing periodic or replacement maintenance.

H. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.

I. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers.
   1. For masonry and drywall construction: Milcor Style M
   2. For plastered masonry walls and ceiling: Milcor Style K
   3. For ceramic tile or glazed structural tile: Use stainless steel panels

2.04 PIPE ENCLOSURES

A. Minimize number of covers by enclosing maximum number of pipes in each drop.

B. Anchor to equipment or partition.

C. Fasten seams and joints with stainless steel pop rivets.

D. Provide 1-1/2" ceiling flange as closure.

2.05 SLEEVES

A. Materials
   1. Concrete floors, concrete and masonry walls: 18 gauge galvanized sheetmetal.
   2. Drywall partitions: 18 gauge galvanized steel sheet metal.

B. Sleeves shall be sized such that the annular space between outside surface of pipe or pipe insulation and the inside surface of the sleeve is not less than 1/2". Provide larger annular space if required by firestopping product installation instructions.

C. Sleeves supporting riser piping 4" and larger shall have three 6" long reinforcing rods welded radically at 120 degree spacing to the sleeve and shall be installed with the rods embedded in the concrete slab.

PART 3 EXECUTION

3.01 EXCAVATING AND BACKFILLING

A. Contractor shall review Division 33 and shall perform excavation and backfilling in accordance with the most stringent requirements. Contractor shall request clarification before proceeding if there are conflicting instructions.

B. Contract Documents show the approximate location of underground utilities known to exist in the area of construction. Contractor shall determine the exact location of utilities
   1. Locate and uncover existing utilities which require new connections before trenching in the vicinity of indicated utility connection.
   2. Clear all vegetation and other objectionable material from the area required for the excavation and backfill operations. Disposal of material removed by the clearing operation shall be approved by the Owner's Representative.

C. Provide trenching, excavating, and backfilling necessary for performance of work indicated in Contract Documents.

D. Excavate to depths indicated on the drawings or as necessary to permit the installation of pipe, bedding, backfill, structures or appurtenances. Provide a firm, undisturbed, uniform surface in the bottom of trenches. Where excavation exceeds the required depth, bring the excavation to proper grade through the use of an approved incompressible backfill material. Store excavated material and dispose of surplus excavated material.
   1. Excavate trench to sufficient depth to permit a minimum of 36" of cover over the top of the pipe unless otherwise required by pipe elevations indicated on the Drawings. The trench width shall be 18" plus the diameter of the pipe and/or the largest bell.

E. Trenching and excavation shall be unclassified. No extra will be paid in the event that rock is encountered.
   1. Should rock excavation be required, use only experienced personnel for blasting.
   2. Exercise extreme care when blasting with signals of danger given before firing any charge.
   3. Conform to and obey all public authority regulations for the protection of life and property.

F. Provide sheathing, shoring, dewatering, and cleaning necessary to keep trenches and their grades in proper condition and to meet applicable codes.

G. Provide a minimum of 6" of No. 67 crushed stone or clean sand bedding, or equal, in the bottom of the trench to maintain the required grade and continuous support of the bottom quadrant of the pipe. On bell and spigot piping, dig bell holes so bottom of bells do not support pipe.

H. Upon completion of excavation, and prior to the laying of the pipe, the trench bottom shall be brought up to the required elevation with min. 6" pipe bedding. Pipe bedding shall be select material deposited in the trench, and shall be compacted, leveled off, and shaped to obtain a smooth compacted bed along the laying length of the pipe. Material for pipe bedding shall comply with local codes. In absence of local code requirements the bedding shall be bank sand or select back fill material approved by the Architect. Any material used shall pass a 1/4 inch screen.

I. Clean and inspect pipe for defects before lowering into trench for assembly. Install pipe in accordance with provisions of Contract Documents and with the recommendations of the pipe manufacturer.
   1. Ensure pipe is of proper strength and classification for specified service. Discard damaged or defective pipe discovered during pipe laying operations.

2. Maintain alignment and grade during layout operation. Use acceptable method for maintaining grade and alignment to produce desired results.

J. Where crushed stone backfill is required, use No. 67 stone, clean sand or equal.
   1. After bedding has been shaped and the pipe assembled, place crushed stone carefully around the pipe and to a point 12" above the pipe. Backfill above this point shall be as described below:
      a. Backfill areas of vehicular traffic shall consist entirely of crushed stone and compacted crusher run material.
      b. Backfill for shoulders of roadways, sidewalk, and slab on grade structures shall consist entirely of crushed stone.
      c. Backfill areas not subject to vehicular traffic may consist of suitable excavated material as described above.
   2. Where crushed stone is not required, suitable excavated material may be utilized. This includes fine, dry earth or a mixture of earth and shot rock. Rocks larger than 6" in any dimension may not be included in any portion of the backfill material.
   3. Trenches shall be backfilled only after piping has been inspected, tested, and approved by the Architect . All backfill material shall be placed in the trench either by hand or by approved mechanical methods. The compaction of backfill material shall be accompanied by tamping, with hand tools or approved pneumatic tampers, by using vibratory compactors, by puddling, or by any combination of the three. The method of compaction shall be approved and all compaction shall be done to the satisfaction of the Architect. Backfill completely around pipe, including 18" above the pipe, with suitable bank sand, tamped in 4" layers under, around, and over pipe. Water down backfill as required. The remainder of the backfill shall be select backfill material tamped at intervals of no more than 12" depths. All materials to be used as selected material backfill shall be approved by the Architect. If, in the opinion of the Architect, the excavated material does not meet the requirements of selected material, the Contractor shall be required to screen the material prior to its use as selected material backfill. Material used in the upper portion of the backfill or subgrade shall not contain stone, rock, or other material larger than six inches in its longest dimension. No wood, vegetable matter, or other material which, in the opinion of the Architect, is unsuitable shall be included in the backfill. The upper 24" of backfill may be water jetted, if desired. Backfill shall be brought up to finish grade identified on the Architectural Drawings, including additional backfill required to offset settlement during consolidation.

3.02 CUTTING AND PATCHING

A. Repair or replace damage caused by cutting or installation of work specified in Division 22.

B. Perform repairs with materials which match existing and install in accordance with the appropriate section of these specifications.

3.03 FLASHING AND COUNTERFLASHING

A. Counterflash pipes where penetration of roofs and outside walls occur.

3.04 CONNECTION TO EQUIPMENT FURNISHED BY OWNER

A. Connect or install equipment shown on plumbing drawings that requires plumbing connections.

B. Provide piping, shutoff valves, unions, and other piping appurtenances required for a complete installation. Provide backflow preventers and/or pressure reducing valves where required by the equipment design or local code. All components shall be line size unless noted otherwise.

3.05 DELIVERY, STORAGE, AND PROTECTION

A. Insofar as possible, deliver items in manufacturer's original unopened packaging. Where delivery in original packaging is not practical, provide cover and shielding for all items with protective materials to keep them from being damaged. Use care in loading, transporting, unloading, and storing to keep items from being damaged.

B. Store items in a clean, dry place, and protect from damage. Plumbing equipment may not be staged or stored outdoors unless intended for outdoor use.

C. Protect nameplates on motors, pumps, and similar equipment. Do not paint or insulate over nameplate data.

D. Protect plumbing fixtures and brass or chromium plated trim, valves and piping from damage. Cover fixtures during work of finishing trades.

E. Keep dirt and debris out of pipes and ducts.

F. Repair, restore, and replace damaged items.

G. Cover factory finished equipment during work of finished trades.

3.06 SLEEVES

A. Floors: Sleeve all pipe penetrations. Extend sleeve 1-1/2" above finished floor, except piping within pipe chases. Sleeve shall be flush with underside of floor.

B. Masonry or concrete walls: Sleeve all pipe penetrations. Sleeves shall be flush on both sides of wall.

C. Drywall partitions: Sleeve all penetrations of piping in systems over 160 degree F.

D. Seal voids between outside surface of sleeve and wall, partition or floor. Seals shall be airtight.

E. Install piping, insulation and sleeves in strict accordance with applicable U.L. floor or partition assembly instructions. Coordinate with Division //CSI //MF95 7//MF04 07//END_CSI firestop manufacturer's installation instructions.

F. Penetrations not sleeved or firestopped:
   1. Seal voids between pipe and partition. Seals shall be airtight.

3.07 CLEANING PLUMBING SYSTEMS

A. General Cleanup:
   1. Upon completion of contract and progressively as work proceeds, clean up dirt, debris, oil materials, etc., and remove from site, keeping premises in neat and clean condition to satisfaction of the Architect. See Division 01 of specifications for further requirements.
   2. See page, discoloration or other damage to parts of the building, its finish, or furnishings due to Contractor's failure to properly clean piping systems or duct systems shall be repaired without cost to the Owner.

B. Factory Finishes:
   1. Clean items with factory finishes. Touch up bare places, scratches and other minor damage to finishes. Use only factory supplied paint of matching color and formula. If finishes are badly damaged or if there are many damaged, scratched or bare places, refinish the entire item.

C. Domestic Water System:
   1. Flush system progressively by opening building operable valves, faucets and hose bibs and permitting flow to continue from each unit until water runs clear.
   2. Sterilize system in accordance with requirements of State Department of Public Health by the following method or other methods acceptable to authority having jurisdiction.
   3. Introduce chlorine or a solution of calcium or sodium hypochlorite. Fill lines slowly and apply sterilizing agent at a rate of 50 ppm of chlorine as determined by residual chlorine tests at ends of lines. Open and close all valves while system is being chlorinated.
   4. After sterilizing agent has been applied and left standing for 24 hours, test for residual chlorine at ends of lines. If test indicates there is less than 25 ppm, repeat sterilizing process.
   5. After system has been standing 24 hours and test indicates at least 25 ppm of residual chlorine, flush out system until all traces of chemical used are removed.
   6. Have local health department check and approve system before connecting it to existing water system.

3.08 SYSTEMS TESTING

A. Test all systems and equipment installed to demonstrate proper operation.

B. Advise Architect of scheduled systems testing and completed system demonstration/operation schedules so that he may witness, if desired.

C. Correct and retest work found defective when tested.

D. Make repairs to piping systems with new materials. Peening, doping, or caulking of joints or holes will not be acceptable.

E. Domestic Water Piping: Test hot and cold water piping systems upon completion of rough-in, before fixtures are connected, at a hydrostatic pressure of 125 psig or 150% of working pressure whichever is greater for a period of two hours.

F. Drainage and vent system
   1. Test plug opening to permit system to be filled with water, and subject system to 10 foot head of water pressure. System shall hold water for 30 minutes with a drop in water level not to exceed 4 inches in a 4 inch diameter standpipe, and without visible leakage.
   2. If system is tested in sections, a minimum head of 10 feet shall apply.

END OF SECTION

SECTION 22 05 23

VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED WORK

A. Section 22 11 16: Domestic Water Piping

1.02 QUALITY ASSURANCE

A. Valve bodies, shells, and seats: Factory tested.

B. Bronze body valves:
   1. Materials for pressure containing parts: ASTM B-62 (less than 200 psi), B-61 (200 psi and above)
   2. Design, workmanship, testing: MSS-SP-80

C. Iron body valves:
   1. Materials for pressure containing parts: ASTM A126, Grade B
   2. Face-to-face and end-to-end dimensions: ANSI B16.10
   3. Design, workmanship, testing: MSS-SP-70, 71

D. Butterfly valves:
   1. Face-to-face and end-to-end dimensions: MSS-SP-67

E. Valve stems: ASTM B584-78, Class 13C (cast silicon brass), ASTM B-371-79, Alloy A (rolled silicon brass), or other material equally resistant to dezincification.

F. Pressure castings: Free of impregnating materials.

G. Valve name or trademark and working pressure stamped or cast into body.

H. Standard for 200 PSI and 300 PSI valves with metallic seats: ASTM B61-76.

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Iron body valves: Nibco, Stockham, Crane, Milwaukee, Dezurik, Mueller, or Kennedy

B. Bronze body valves: Nibco, Stockham, Milwaukee, Dezurik, or Kennedy

C. Butterfly valves: Nibco, Stockham, Crane, Mueller, or Dezurik

D. Ball valves: Nibco, Apollo, Watts, Milwaukee, Jamesbury or Hammond

2.02 MATERIALS

A. Nibco Figure numbers are indicated below unless noted otherwise:

B. Check Valves:
   1. Domestic Water:
      a. 2" and less, Figure T-433, or S-433, threaded or solder, Class 150
      b. 2-1/2" and up: Bronze body, cap, and disc, flanged, Class 150

C. Ball Valves
   1. Domestic Water
      a. 2" and less, Figure T585-70 or S-585-70, 2-piece, full port, 600 psi, WOG, TFE seats
      b. 2-1/2" and up, Watts G4000-FDA-200 psi, Class 125 meeting MSS-SP-72-92 or equal

D. Butterfly Valves - 2-1/2" And Up:
   1. Domestic Water: Figure LD-2000, lug type, 200 psi, Class 125, EPDM liner, and aluminum bronze disc, meeting AWWA C504-88.
   2. Butterfly valves rated bubble tight for dead end service at full pressure in both directions without the need for downstream blind flange.
   3. Provide hand wheel and closed housing worm gear on valves 8 inches and larger. Provide clamp lock hand lever operators on valves less than 8 inches.

E. Valve connections: Two inches and smaller - threaded; 2-1/2 inches and larger - flanged.

F. Provide chain operators for gate valves, butterfly valves, and plug cocks located in mechanical rooms as required by mechanical plans or where valves are mounted above 7'-0" A.F.F.

PART 3 EXECUTION

3.01 INSTALLATION

A. Furnish and install valves in each piping connection at each piece of plumbing equipment to allow equipment to be isolated from piping systems.

B. Furnish and install valves above each group of plumbing fixtures.

C. Install valves in water piping systems so ordinary maintenance work can be performed on the equipment that the valves isolate, without having to drain the system beyond the valve.

D. Locate valves so as to be easily accessible by maintenance personnel.

END OF SECTION

SECTION 22 05 29

HANGERS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED WORK

A. Section 22 11 16: Domestic Water Piping

B. Section 22 13 16: Sanitary Waste and Vent Piping

C. Section 22 07 00: Plumbing Insulation

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Anvil, Carpenter and Patterson, Fee and Mason, B-Line, Viking, Reliable, and Michigan. Anvil numbers are used for reference.

2.02 HANGERS

A. Anvil Figure #260 MSS Type 1, clevis hangers for:
   1. Non-insulated steel and galvanized piping 2" through 24" diameter
   2. Non-insulated cast iron pipe
   3. Non-insulated PVC piping

B. Anvil Figure #260 clevis hangers with Figure 167, MSS Type 40 galvanized insulation protection shields (sized for supporting insulation having a compressive strength of 4 psi). Support piping on outside of insulation. Size hangers so that pipe insulation passes through them without interruption.
   1. Domestic hot water piping above 160 degrees F. 4" diameter and less
   2. All other insulated piping

C. Anvil Figure CT-69, MSS Type 10 with adjustable wrought tubing ring hanger, copper plated for:
   1. Non-insulated copper tubing with no longitudinal movement

D. Anvil Figure #CT-121, MSS Type 8, riser clamps (at floor penetrations) to support:
   1. Copper pipe risers

E. Anvil Figure #261, MSS Type 8, riser clamps (at floor slab penetrations) to support:
   1. Steel pipe risers
   2. PVC pipe risers

F. Anvil Powerstrut Trapeze Hangers: Where three or more lines of pipe run parallel, support them with trapeze hangers.

2.03 INSERTS

A. Concrete Insert: Anvil Figure #281, MSS Type 18, universal concrete inserts, adequately sized and correctly positioned to support full load operating systems.

B. Concrete Insert, Wedge Type: Anvil Figure #281, 1/4" to 7/8"

C. Lightweight Concrete Insert: Anvil Figure #285

D. Continuous Concrete Insert: Anvil Powerstrut Figure #PS-349 pre-galvanized

2.04 EXPANSION ANCHORS

A. Hilti Kwik-bolt, zinc plated, metal expansion anchor.

B. Anchor to meet U.L., ICBO-4627 and FM listings.

2.05 CLAMPS

A. C-Clamps: Anvil Figure #92, MSS Type 23.
   1. Use these for attaching hangers to steel beams. Do not weld hanger rods to structural steel members.

B. Malleable Beam Clamps: Anvil Figure #218, MSS Type 30: Use these for attaching hangers to bar joists.

PART 3 EXECUTION

3.01 PIPE HANGERS

A. Support pipes on specified hangers so that equipment, pumps, and fittings do not bear weight or stresses from vibration and swaying of pipe. Support pipe risers at regular intervals in pipe shafts at least once at each floor level or a maximum of 12'-0" apart. Do not use perforated metal, strap iron, or band iron. Do not make offsets in hangers.

B. Maximum allowable spacing of pipe hangers is listed below. Space hangers and brackets at closer intervals where necessary to maintain levels, slopes, and drainage, or to prevent sagging or swaying of pipe.

C. COPPER PIPE - Water
   1. 1/4" to 1-1/4" - 5'0" O.C.
   2. 2" to 2-1/2" - 8'0" O.C.
   3. 3" and above - 10'0" O.C.

D. CAST IRON PIPE
   1. Space hangers not to exceed 10 feet on centers. Provide minimum of two hangers per section close to joint on barrel and at change of direction and branch connection.

E. PVC PIPE
   1. 3/4" to 3" - 4' O.C.
   2. 4" and above - 8' O.C.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION OF PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification of plumbing piping and equipment as specified herein.

1.02 RELATED WORK

A. Division 01: Cutting and Patching.

B. Division 01: Seismic Requirements.

C. Division 01: Shop Drawings, Product Data, and Samples.

D. Division 01: Storage and Protection.

PART 2 PRODUCTS

2.01 NAMEPLATES AND TAGS

A. Acceptable manufacturers: Seton Nameplate Corporation, Marking Services Inc. or equal.

B. Rigid plastic, "Setonite" or Bakelite with engraved lettering, minimum 1/2" high.

C. Brass tags, at least 1-1/2" inches in diameter, with alpha-numeric I.D., permanently stamped black filled letters showing the service, and black filled numbers showing the valve or equipment number. At substantial completion, a schedule of all valves shall be submitted to the Architect and Owner's Representative.

2.02 PIPE MARKERS

A. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering.

B. Plastic Tape Markers: flexible vinyl film tape with pressure sensitive adhesive and printed marking.

2.03 PIPE IDENTIFICATION AND PAINTING

A. Identify all piping as specified herein painted under Division 09.

B. Pipe Identification:
   1. Identify piping by stenciling or tagging (to denote contents and direction of flow) on piping at no more than 25 foot intervals at valves, and at least once in each

separate space through which the pipe passes. Colors shall conform to ASME 13.1.

2. Stenciling shall be a minimum of 2" high letters.

C. Buried piping does not require identification marking, unless noted otherwise in specifications.

D. All piping in central plant and mechanical rooms shall be labeled to identify contents and direction of flow.

2.04 EQUIPMENT AND APPARATUS IDENTIFICATION

A. Acceptable Manufacturers: Seton Name Plate Corporation or equal.

B. Nameplates: Rigid plastic, "Setonite" or Bakelite, with engraved lettering (indicating names and numbers of mechanical apparatus), a minimum of 1/2" high. Fill engraved lettering with a permanent coloring material which contrasts with color of tag material to allow for easy reading.

C. Use names, numbers and abbreviations appearing in schedules on Contract Drawings.

D. Where stenciling is used to identify large pieces of equipment, stenciling shall be in a conspicuous place visible from control panel area and of at least one (1) inch letters and/or numbers. Large pieces of equipment may be stenciled with an oil based enamel or semi-gloss latex.

E. Provide nameplates, located in a conspicuous location directly on the equipment or apparatus, for mechanical equipment including, but not limited to:

1. Plumbing equipment

F. Name tag Fasteners: Commercial quality, rust resisting nuts and bolts with backwashers, self-tapping screws, or rivets. If equipment surface does not allow for direct attachment, use copper or brass rings to attach tags.

G. Valve Tags

1. Each valve shall be identified with a brass tag. The tag shall contain an alpha-numeric I.D. which shall include floor level and building section as part of the I.D.
2. A valve schedule shall be provided to Architect and Owner's Representative. Mount valve schedule under glass and mount as directed by Owner's Representative.
3. Securely fasten tags to valves with a brass "S" hook or chain.

END OF SECTION

SECTION 22 07 00

PLUMBING INSULATION

PART 1 GENERAL

1.01 DEFINITIONS

A. Exposed - Equipment and piping in areas which will be visible without removing ceilings or opening access panels.

B. Concealed - Installed above ceiling, in walls or chases.

C. Outdoors - Exposed to the weather or ambient conditions.

D. Underground - Buried.

1.02 CERTIFICATION/QUALITY ASSURANCE

A. Insulation, adhesives, coatings, sealers, tapes, shall have a flame spread rating of 25 or less and smoke development of 50 or less in accordance with ASTM E-84 and UL 723

B. Materials shall meet the requirements of NFPA 90-A.

1.03 SUBMITTALS

A. Submit manufacturer's product data and installation procedures for review.

PART 2 PRODUCTS

2.01 PIPE AND EQUIPMENT INSULATION

A. Materials for Pipe and Equipment: Provide factory pre-molded insulation for pipe, pipe fittings, and valves.

B. Fitting insulation: Same thickness and material as adjoining pipe insulation.

C. Fiberglass Pipe Insulation:
   1. Acceptable manufacturers: Johns-Manville "Micro-Lok 850"; CertainTeed; Knauf; Owens Corning. Foster Jacket: ASJ fiberglass reinforced kraft paper with aluminum foil; minimum R value of 3.7.
   2. Use on the following services:
      a. Domestic hot water supply piping - 1" thick
      b. Domestic cold water piping - 1/2" thick
      c. Drain bodies, traps and horizontal drain lines receiving cold condensate - 1/2" thick

2.02 MATERIALS FOR FITTINGS, VALVES, AND SPECIAL COVERINGS

A. For all services, use pre-molded insulation for pipe fittings, elbows, tees, butterfly valves, and couplings 2-1/2 and larger. Finish shall be as specified under Products above or as specified below. PVC fitting covers with fiberglass inserts may be used on piping fittings elbows and valves 2" and less for the following services:
   1. Domestic Cold Water
   2. Domestic Hot Water

B. For piping installed above grade exposed-to-the-weather outside the building, cover straight pipe insulation with 0.016" thick aluminum jacket equivalent to Childers and cover fittings with factory formed covers equivalent to Elljacs.

C. For flexible tubular elastomeric pipe and fitting insulation when exposed-to-view inside building or exposed to the weather, finish with two coats of fire retardant self-extinguishing vinyl lacquer type highly flexible coating equivalent to Armacell "Armaflex Finish", custom color blended to match surrounding surfaces.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Deliver and store insulation materials in manufacturer’s containers and kept free from dirt, water, chemical and mechanical damage.

B. Complete piping pressure testing prior to applying insulation.

C. Apply insulation in workmanlike manner by experienced and qualified workmen.

D. Surfaces shall be clean and dry when covering is applied. Covering to be dry when installed and before and during application of any finish, unless such finish requires specifically a wetted surface for application.

E. Adhesives, cements and mastics shall be compatible with materials applied and shall not attack materials in either wet or dry state.

F. Stop duct coverings, including jacket and insulation, at fire penetrations of fire or smoke rated partitions, floors above grade and roofs. "Fan-out" or extend jacketed insulation at least 2" beyond angle frames of fire dampers and secure to wall. Maintain vapor barrier.

3.02 FLEXIBLE SHEET ELASTOMERIC INSULATION

A. Prior to application of flexible sheet elastomeric insulation, thoroughly clean all metal surfaces, making sure that all dirt, scale, loose paint, plaster, and oil has been removed and that surfaces are dry. If surface has been primed, test a two square foot section using adhesive equivalent to Armstrong No. 520 in order to determine whether solvent in adhesive will loosen or lift the primer. If primer is loosened, then remove it. When testing proves acceptable, adhere insulation with smooth side out, using thin but adequate coating of same adhesive. Follow manufacturer's instructions. Coat all butt edges of each

sheet. Stagger all joints. Insulate all standing seams or flanges with same thickness of insulation material as that used on main surface.

3.03 INSTALLATION OF PIPE AND EQUIPMENT COVERING

A. Where glass fiber or flexible tubular elastomeric insulation is used on piping sized 2" and larger, insert a section of foamglass or calcium silicate insulation, at hanger or support points, between pipe and metal shield for full length of shield, to prevent crushing of insulation. Where insulation passes through pipe hangers and across trapeze supports, 12" long metal saddles shall be used. Insulation thickness to be same as adjoining glass fiber insulation. On cold pipe, vapor barrier should be carried through the hanger and sealed. Saddles shall be used where rigid foamglass inserts are not acceptable.

B. Apply foamglass insulation as follows:
   1. Both the circumferential and longitudinal joints shall be buttered with fire-resistive pliable sealer. Voids and cracks shall be filled with sealer. Mastic shall be Foster 30-80 or equal. Secure insulation with 3/4" wide x 0.010" thick aluminum bands on 8" centers.
   2. The circumferential joints shall be staggered.
   3. Fittings, valves, flanges, traps, and air vents shall be insulated with the same thickness of insulation using factory fabricated fitting sections or pre-molded insulated fittings.
   4. Block type insulation shall be adhered by stick-clips or bands, in addition to the sealer, as required to provide support for the insulation.
   5. Finish above furred ceilings and in chases shall be the bare insulation.
   6. Finish in equipment rooms and elsewhere where exposed-to-view shall be //OPT_AR //CHO_S white ASJ jacket.//CHO_N .016" aluminum jacket.//CHO_N white 8 oz canvas paintable jacket.//END_OPT
   7. Finish where exposed-to-the-weather shall be .016 inch thick, Childers, or equal, aluminum jacket on lines and Elljacs, or equal, pre-formed aluminum covering on fittings.
   8. Finish on underground insulation shall be Pittsburgh Corning Pittwrap as recommended by manufacturer.

END OF SECTION

SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Piping and pipe fittings for domestic cold and hot water piping

1.02 RELATED WORK

A. Section 22 05 00: Common Work Results for Plumbing

1.03 SUBMITTALS

A. Submit product data for review on piping and fittings. Submittal data shall include:
   1. Manufacturer of pipe.
   2. Tests or listings by recognized testing laboratory that certifies material composition is in accordance with ANSI/ASTM requirements.
   3. Product data for pipe and fittings to be used on each piping system.
   4. Solder and brazing product data and installation procedures for copper pipe.

PART 2 PRODUCTS

2.01 COPPER PIPE

A. Conform to ASTM B-88 specification for wrought seamless copper.

B. Type L, hard for:
   1. Domestic cold water piping
   2. Domestic hot water

C. Use Type K, rolled, soft for: Piping installed under floor slabs.

2.02 COPPER PIPE FITTINGS

A. Sweat type, wrought copper, ASTM B62, with dimensions conforming to ANSI B16.22 and sweep patterns for copper tubing.

B. Mechanical Couplings: Roll groove rigid type by Victaulic, Gruvlok or Anvil.

C. Mechanically formed tee fittings: "T-Drill" system in compliance with Copper Development Association (CDA), Copper Tube Handbook, and ASME Code for pressure piping ANSI B31.5C. All joints shall be brazed in accordance with CDA Copper Tube Handbook using BCuP filler material. Soft solder joints will not be approved.

D. Mechanical joints: Domestic cold and hot water piping 4" and larger may be joined with rolled grooved copper fittings and valves by Victaulic or Anvil, copper pipe grooved

systems. Gaskets shall be rated for not less than 220 degrees. Joints, materials, and gaskets for grooved systems shall be approved for use in potable water systems.

E. Dielectric Connections:
   1. Provide at junction of copper pipe and equipment with steel piping systems.
   2. Central, Dielectric insulating unions, and insulating flange unions, as manufactured by Central Plastic Company, or CTS Fabrication USA (1-1/2" thru 8").
   3. Provide copper solder joint to plated female iron pipe for sizes 1/2" through 2".
   4. Provide insulating flange unions, malleable female iron pipe thread to copper solder joint flange unions for sizes 2-1/2" through 4".
   5. Brass fittings and valves may not be used for dielectric union locations.

F. Unions: Brass ground joint, 250 lb. working pressure.

G. Nipples: Brass.

H. Grooved copper system:
   1. Victaulic Style 606 or Style 641 rolled grooved copper fittings for domestic cold water and domestic hot water for sizes 3" and larger

2.03 DUCTILE IRON WATER PIPE AND FITTINGS UNDERGROUND

A. Manufactured in accordance with latest revision of ANSI A21.51/AWWA C151.

B. Use Class 52 thickness or heavier for 12" diameter and less and Class 51 thickness or heavier for 14" diameter and larger.

C. Furnish pipe with standard thickness cement lining on inside with a bituminous seal coat and a bituminous coating on the outside.

D. Clearly mark pipe exterior to indicate the manufacturer, date of manufacturer, pipe class and weight.

E. Provide for the following services:
   1. Underground domestic water main services, up to first joint inside interior space

F. Fittings:
   1. Acceptable Manufacturers: Fastite by Acipco, Tyton by U.S. Pipe Co., or Bell-Tite by James B. Clow and Sons
   2. Ductile iron, cement lined, bituminous coated, manufactured in accordance with the latest revision of ANSI/AWWA C110
   3. Furnish with mechanical joints conforming to ANSI A21.11 with 250 psi pressure rating

2.04 PVC AND CPVC PIPE AND FITTINGS

A. Polyvinyl chloride sewer pipe and fittings (4" to 12" diameters) shall be as manufactured by Charlotte or equal. Fittings (14" to 24" diameter) shall be manufactured by Freedom Plastics, Inc.

B. PVC and CPVC pipe, fittings, cement, and joint cleaner for entire project shall be supplied by a single manufacturer.

C. PVC schedule 40, type 1, DWV, ASTM D-2665, 1120, 160 PSI at 73 degrees F. Solvent cement shall meet ASTM No. D-2564 for (PVC-DWV) plastic and pipe fittings. If permitted by governing code authority, may be used for:
   1. Inside gravity { [under floor slab], under and above floor slab in non-sound sensitive areas} sanitary and storm waste drainage systems, with waste temperatures below 140 degrees F.
   2. Do not install PVC piping in return air plenums or spaces used as return air plenums and as approved by the Local Authority Having Jurisdiction

D. CPVC schedule 80, ASTM D-2846, 230 psi at 73 degrees F. Solvent cement shall meet ASTM No. F-493 for chlorinated polyvinyl chloride (CPVC) plastic pipe and fittings. If permitted by governing code authority, may be used for:
   1. Inside gravity, under floor slab sanitary waste drainage systems, where temperature of waste discharged into drainage system exceeds 140 degrees F.

E. PVC schedule 40, Type-PSM, Sewer Pipe, ASTM D-3034 with SDR as gasketed slip type joints. Provide coupling with a rubber ring seal for use in each manhole entry to ensure a surface for adherence of concrete to manhole wall. If permitted by governing code authority, may be used for:
   1. Outside gravity, underground sanitary sewer drainage piping, from 5'-0" outside the building to the connections point to local municipality

F. Fittings:
   1. Permanently identify each fitting in accordance with MSS-SP-2241, and with manufacturer's trademark
   2. Include certification with submittal data that fittings and flanges meet applicable requirements

PART 3 EXECUTION

3.01 INSTALLATION

A. Clean inside of pipe before installation. Keep installed piping clean, and protect ends from foreign matter by capping or plugging them.

B. Install pipe so that it does not interfere with opening of doors or apparatus, access to equipment, or to electrical equipment.

C. Run pipes in straight lines and square with building. Install risers plumb. Make offsets only where indicated and where necessary.

D. Install branch connections using separate tee or lateral fittings for each branch. Do not combine branches into "bullhead tee" arrangement.

E. Do not install water pipes in electric rooms, tele/data rooms, transformer rooms, audio/visual rooms or elevator equipment rooms.

F. Do not install piping above electrical equipment such as starters, variable frequency drives, motor control centers, or disconnects. Maintain code required clearance above, below and to sides of electrical equipment.

G. Provide flanges or unions throughout the pipe systems at all equipment. Make provisions for servicing and removal of equipment without dismantling piping.

H. Piping Expansion:
   1. Install piping to allow thermal expansion and contraction without injury to piping, equipment or structure.
      a. Use loops or expansion joints where necessary and where detailed
      b. Provide pipe guides

I. Branch Lines:
   1. Where possible branch lines shall come off top of mains to prevent sediment, welding slag, or pipe deburrs from entering the branch lines and causing valve leakage or failure.

3.02 PIPE JOINTING

A. Preparing Pipe Ends:
   1. Machine cut pipe ends square
   2. Ream pipe ends, after cutting, to full diameter

B. Soldered and Brazed Joints:
   1. Make Type L copper pipe joints with suitable flux and 95/5, lead free solder.
   2. Make Type K copper pipe joints with silver (BAg series) brazing filler material with flux or copper-phos (BCup series) brazing filler material without flux per the recommendations of the Copper Development Association.
   3. Domestic cold and hot water piping 4" and larger shall be brazed. Copper to copper joints shall be brazed using a copper-phosphorus or copper-phosphorus-silver brazing filler metal (BCup Series) without flux. Dissimilar metals such as copper and bronze or brass shall be brazed using an appropriate flux with a silver (BAg Series) brazing filler metal.
      a. In lieu of brazing, domestic cold and hot water piping 4" and larger may be joined with rolled grooved copper fittings and valves by Victaulic or Anvil, copper pipe grooved systems.

C. Bracing Joints:
   1. Provide braces and bridle rods as required to reinforce joints.
   2. If mechanical couplings are used, then prepare pipe ends and make joints in accordance with pipe coupling manufacturer's printed instructions.
   3. Where large pipes underground are subject to shock because of sudden changes in liquid flow rate, provide concrete "kicker" blocks at joints, fittings, and changes of pipe direction. Provide "kicker" blocks in accordance with applicable pipe industry trade or research organization recommendations.
      a. For example, for ductile iron pipe follow recommendations of Ductile Iron Pipe Research Association.

3.03 ESCUTCHEONS

A. Provide chrome plated escutcheons where uninsulated pipes penetrate walls or ceilings of finished spaces.

3.04 AIR VENTING

A. Provide manually operated air vents at high points in vertical risers to eliminate air from systems.

B. Use ball valves for manual air vents.

3.05 VALVE ACCESS

A. Locate ceiling/wall access panels at shut-off and control valves for proper access and operation. Furnish and install access doors in accordance with Section 22 05 00 and other Divisions as applicable.

3.06 TESTING

A. Before piping is concealed or insulated, recheck it for leaks.

B. Rework or replace defective and leaking joints, and joints which are otherwise unsatisfactory. Preening, caulking, and doping are not permitted.

END OF SECTION

SECTION 22 11 19

DOMESTIC WATER PIPING SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes requirements for:
   1. Shock arrestors.
   2. Trap primers.
   3. Domestic water service connection.

1.02 RELATED WORK

A. Section 22 05 00: Common Work Results for Plumbing

B. Section 22 05 23: Valves for Plumbing Piping

C. Section 22 07 00: Plumbing Insulation

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are indicated in subsequent paragraphs.

2.02 SHOCK ARRESTORS

A. Acceptable manufacturers:
   1. Josam
   2. Wade
   3. Jay R. Smith
   4. Precision Products
   5. Zurn
   6. Sioux Chief

2.03 DOMESTIC WATER SERVICE CONNECTION

A. Provide tapping sleeve and valves for connection to existing water mains.

B. Provide domestic water meters, gate valves, check valves, bypass feature, and meter pit per local utility company standards.

PART 3 EXECUTION

3.01 INSTALLATION AND TESTING

A. Shock Arrestors:
   1. Install shock arrestors at each quick closing valves, solenoid type valves, and flush valves. Size shock arrestors in accordance with manufacturer's instructions.
   2. Install shock arrestors within five feet of valve, provide wall access panel as required.
   3. Test and certify shock arrestors by Plumbing and Drainage Institute.

B. Domestic Water Service Connection
   1. Arrange and coordinate with local utility company for service connection, meter type and manufacturer, fees, permits, etc.
   2. Field verify exact location, size, pressure, and elevation of existing water main.
   3. Flush system and test at 200 PSI for 24 hours without any leaks.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1- GENERAL

A. RELATED WORK

B. Section 22 05 00: Common Work Results for Plumbing

1.01 SUBMITTALS

A. Submit product data for review on piping and fittings. Submittal data shall include:
   1. Manufacturer of pipe.
   2. Tests or listing by recognized testing laboratory that certifies material composition is in accordance with ANSI/ASTM requirements.
   3. Product data for pipe and fittings to be used on each piping system.

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 CAST IRON SOIL AND VENT PIPE

A. Conform to ASTM A-74, A-888, and CISPI 301,310.

B. Standard weight pipe with drainage fittings for:
   1. Sanitary waste, vent, and drainage pipe 2" and larger above ground.
   2. Drain lines under buildings, and under exterior concrete or other paving. Extend cast iron piping at least 5 feet outside of building.

C. Joints in Cast Iron Pipe:
   1. Below grade: Bell and spigot with neoprene compression gaskets
   2. Above grade: No-Hub using stainless couplings, meeting CISPI 310-90

2.02 PVC PIPE AND FITTINGS

A. Polyvinyl chloride sewer pipe and fittings (4" to 15" diameters) shall be as manufactured by H and W Industries or equal.

B. PVC pipe, fittings, cement, and joint cleaner for entire project shall be supplied by a single manufacturer.

C. PVC schedule 40, Type I, DWV, ASTM D-2665, 1120, 160 PSI at 73 degrees F. Solvent cement shall meet ASTM No. D-2564 for (PVC-DWV) plastic and pipe fittings. If permitted by governing code authority, may be used for:
   1. Inside gravity, under floor slab sanitary and storm waste drainage systems, with waste temperatures below 140 degrees F.

D. CPVC schedule 80, ASTM D-2846, 230 psi at 73 degrees F. Solvent cement shall meet ASTM No. F-493 for chlorinated polyvinyl chloride (CPVC) plastic pipe and fittings. If permitted by governing code authority, may be used for:
   1. Inside gravity, under floor slab sanitary waste drainage systems, where temperature of waste discharged into drainage system exceeds 140 degrees F.

E. PVC schedule 40, Type-PSM, Sewer Pipe, ASTM D-3034 with SDR as gasketed slip type joints. Provide coupling with a rubber ring seal for use in each manhole entry to ensure a surface for adherence of concrete to manhole wall. If permitted by governing code authority, may be used for:
   1. Outside gravity, underground sanitary sewer drainage piping, from 5'0" outside the building to the connections point to local municipality.

F. Fittings:
   1. Permanently identify each fitting in accordance with MSS-SP-2241, and with manufacturer's trademark.
   2. Include certification with submittal data that fittings and flanges meet applicable requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. PVC Joints:
   1. Make joints in accordance with cement manufacturer's printed instructions.

B. Cast Iron Pipe Joints:
   1. Install compression gaskets and No-Hub bands in accordance with CISPI installation methods and manufacturer's instructions.

END OF SECTION

SECTION 22 13 19

SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes requirements for:
   1. Cleanouts
   2. Trap primers
   3. Sanitary sewer service connection

1.02 RELATED WORK

A. Section 22 05 00: Common Work Results for Plumbing

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are indicated in subsequent paragraphs.

2.02 CLEANOUTS

A. Acceptable manufacturers:
   1. Jay R. Smith (Jay R. Smith model numbers are used below)
   2. Josam
   3. Wade
   4. Zurn
   5. Sioux Chief
   6. Watts

B. Exterior: 4250 Series heavy duty cast iron cleanout housing with internal cleanout body and plug.

C. Finished concrete floor: 4031-PB cast iron body with round adjustable polished nickel bronze top, ABS plug and carpet marker where required.

D. Ceramic tile: 4919 PB series, cast iron body, polished nickel bronze top, 1/2" terrazzo recess and closure plug.

E. Vinyl tile floor: 4151PB series, cast iron body, round nickel bronze top, 1/8" tile recess and closure plug.

F. Carpet: 4031-PBY. Inside caulk round brass scoriated frame and cover and provide carpet marker.

G. Wall: 4422. Cast iron caulking ferrule with stainless round access cover and screws.

H. Access covers: Minimum size 12" x 12" located for access to valves, shock absorbers, trap primers, wall cleanouts, etc.

I. Furnish cleanouts occurring in waterproof floors with clamping devices.

2.03 TRAP PRIMERS

A. Acceptable manufacturers:
   1. Josam
   2. Zurn
   3. Wade
   4. Jay R. Smith
   5. Precision Plumbing Products
   6. MIFAB

B. Provide trap primer of brass construction, with removable operating parts, and integral vacuum breaker.

2.04 SANITARY SEWER SERVICE CONNECTION

A. Provide saddle, cut-in wyes, and/or connection to existing manhole per local utility company standard.

PART 3 EXECUTION

3.01 INSTALLATION AND TESTING

A. Cleanouts
   1. Provide line size cleanouts up to 4"; 4" cleanout for lines larger than 4".
   2. Locate cleanouts at all changes in direction greater than 45 degrees and in straight runs as shown 100 feet outside the building on drawing or spaced not greater than required by applicable Plumbing Code.
   3. Extend inaccessible cleanouts up through floor and/or wall to provide easy accessibility.

B. Trap Primers
   1. Install primers in accessible location or as shown on drawings.
   2. Trap primers shall be Plumbing and Drainage Institute approved.

C. Sanitary Sewer Service Connection
   1. Arrange and coordinate with local utility company for service connection, fees, permits, etc.
   2. Field verify exact location, size, and elevation of existing sewer.
   3. Flush system, fill with water and let stand with a minimum 10 feet of head for 24 hours without any leaks.

END OF SECTION

SECTION 22 33 36

WATER HEATER - ELECTRIC

PART 1- GENERAL

1.01 RELATED WORK

A. Section 22 07 00: Plumbing Insulation

B. Section 22 11 16: Domestic Water Piping

C. Division 26: Electrical

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Lochinvar

B. Bradford White

C. Hesco, Inc

D. A. O. Smith

E. State Industries

F. Rheem/Rudd

2.02 EQUIPMENT

A. Storage tank: 300 psi tested, 150 psi working pressure. ASME stamped and National Board listed. Tank lining: Vitreous glass, polymerized epoxy, or silica cement. Provide 12" x 16" manway on heater 125 gallon and larger.

B. Provide the following features:
   1. Internal fusing for control and load circuits
   2. Incoloy sheath elements
   3. ASME rated temperature and pressure relief valve
   4. Pressure and temperature gauges
   5. Terminal block wiring
   6. Rated for 180 degrees F. water temperature
   7. U.L. Listing
   8. 5 year tank warranty
   9. Element control through thermostatic or solid state step proportional sequencers

10. High density anode rods

C. Safety controls:
   1. Electronic low water cut-off
   2. High/low water pressure cut-off
   3. Fused and switched, 120 volt control circuit

D. Operating and maintenance instructions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Verify location and clearance requirements.

B. Install in accordance with manufacturer's recommendations and contract drawings.

C. Insulation for water connections as specified in Section 22 07 00.

D. Install electric connections under Division 26.

E. Clean and test unit as required by Sections 22 05 00.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with provisions of Section 22 05 00.

B. Provide plumbing fixtures, trim and related items such as supplies, traps, drains, cleanouts, water closet flanges, bolts, seats and covers, fixture supports and other accessory items.

C. Coordinate fixture requirements by reviewing architectural, structural, and equipment drawings. Install fixtures in accordance with Contract Drawings and manufacturer's rough-in drawings.

1.02 RELATED WORK

A. Section 22 13 19: Sanitary Waste Piping Specialties

B. Section 22 11 16: Domestic Water Piping

1.03 CODES AND STANDARDS

A. Perform work in accordance with applicable codes and standards enforced by local authorities.

B. All barrier free fixtures shall be installed in accordance with the Americans with Disabilities Act (ADA) Rules and Regulations.

1.04 SUBMITTALS

A. Submit manufacturer's product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Fixtures: Kohler, American Standard, Crane, Eljer, Toto.

B. Brass Trim: McGuire Engineered Brass Company, Cambridge Brass,

C. Hydrant, floor drains, shock absorbers, carriers and p-traps: Jay R. Smith, Zurn, Wade, Josam, Watts.

D. Flush valves: Flush valves: Sloan Royal, Zurn Z-6000AV with low force handles for ADA compliance.

E. Toilet seats: Olsmite, Beneke, Bemis, Church.

F. Faucets: T&S Brass, Delta HDF Water Saver, Chicago Faucet Company, Cambridge Brass, Kohler, Zurn.

G. Stainless steel sinks: Elkay, Just, Kohler.

H. Flow control devices: Dole Flow Controls Company.

I. Pre-fabricated insulation on water lines and p-trap under barrier free lavatories and sinks: Brocar Products, Inc. Inc. Trap Wrap TrueBro, Inc. Handi Lav-Guard McGuire Pro-wrap.

J. Faucets and flush valves shall meet code and state requirements for water conservation on low consumption fixtures.

K. Provide fixtures and trim as a complete unit as required in the individual "P" numbers listed below.

2.02 MATERIALS

A. Wall hung lavatories: Furnish complete with wall mounting brackets.

B. Countertop sinks: Furnished complete with mounting rings where required.

C. Fixture color: White unless specified otherwise.

D. Faucets and flush valves: Provide either integral or attached supply stops with nipples.

E. Clamping device: Provide for drains installed in slabs above grade.

F. Trap primer: Provide connections for floor drain as shown on drawings.

G. Caulking: General Electric silicon sanitary sealant or equal.

H. Provide Zurn ZR-1231 floor mounted carrier for wall hung lavatories.

I. Provide FRT wood or metal backing at wall fixtures and fixture trim connections so piping and connecting faucets and valves are rigid to wall.

J. Wrist blade operation:
   1. Pull wrist blade to operator to turn on
   2. Push toward splashback to turn off faucet

K. All fixtures and fittings relating to drinking water shall meet the requirement of ANSI/NSF 61, Section 9. Any faucet for drinking water shall be certified by U.L. to the ANSI/NSF 61, Section 9 standards.

2.03 PLUMBING FIXTURES

P-1 WATER CLOSET (FLOOR MOUNTED-FLUSH VALVE (1.6 GPF)
   a. Fixture: K-4350 white elongated bowl

b. Valve: Sloan #111YB 1.6 gallon per flush
c. Trim: Two bolt caps included
d. Seat: Kohler K-4620-C white open front

P-2 WATER CLOSET (FLOOR MOUNTED-FLUSH VALVE - BARRIER FREE - 1.6 GPF)
a. Fixture: Kohler #K-4368, white elongated bowl
b. Valve: Sloan #111YB, 1.6 gallon per flush
c. Seat: Kohler K-4670 white open front
d. Trim: Two bolt caps included

P-3 URINAL (WALL HUNG-FLUSH VALVE)
a. Fixture: Kohler K4960-T, White, elongated rim
b. Valve: Sloan Royal 186-1-YBYC
c. Mounting: 24 inches from finished floor to flood rim

P-4 URINAL (WALL HUNG-FLUSH VALVE-BARRIER FREE)
a. Fixture: Kohler K-5016-T, White, elongated rim
b. Valve: Sloan Royal 180-1-YBYC
c. Mounting: 17 inches from finished floor to flood rim

P-5 LAVATORY (OVAL-DROP IN-SINGLE LEVER)
a. Fixture: Kohler K-2196-4, 20 inches by 17 inches
b. Faucet: Kohler K-15592-5 with McGuire 155-A grid drain
c. Trim: McGuire 2165 supplies with wheel handle stops. One McGuire 8872 1-1/4 inch semi-cast brass P-trap

P-6 LAVATORY (OVAL-DROP IN-OVAL-SINGLE LEVER-BARRIER FREE)
a. Fixture: Kohler K-2196-4, 20"x17"
b. Faucet: Kohler K-15593-5
c. Trim: One McGuire 155-WC 1-1/4 inch grid drain and tailpiece. McGuire 2165 supplies with wheel handle stops. One McGuire 8872 1-1/4 inch semi-cast brass P-trap
d. Mounting: See Architectural Drawings for counter height. Insulate hot water piping and P-trap under sink. Install 5" from counter front to edge of lavatory for ADA compliance

P-7 SINK (S.S. SINGLE COMPARTMENT)
a. Fixture: Just SLX-2017-A-GR, 20"x17"x10.5"
b. Faucet: Kohler K-15171, single lever faucet with K-18036 aerator
c. Trim: One McGuire 151 drain with 1-1/2 inch tailpiece. McGuire 2165 supplies with wheel handle stops. One McGuire 8912 1-1/2 inch by 1-1/2 inch semi-cast brass P-trap

P-8 JANITORS FLOOR BASIN
a. Fixture: Stein-Williams terrazzo SB-900, 24"x24"x12" with stainless steel cap, less tiling flanges
b. Faucet: T. & S. B-695 with vacuum breaker.
c. Mounting: Mount faucet 36 inches above finished floor. Mount vacuum breaker 7 feet 6 inches above finished floor

P-9 SHOCK ABSORBER
- a. Fixture: Jay R. Smith 5005 through 5050 size as recommended by manufacturer

P-10 WATER COOLER FOUNTAIN (WALL HUNG - BARRIER FREE)
- a. Fixture: Sunroc HCWC-8-SS with stainless steel apron
- b. Trim: One McGuire 2165 supply with wheel handle stop. One McGuire 8872 1-1/4 inch semi-cast brass P-trap
- c. Capacity: 8 GPH at 90 degree room temperature
- d. Mounting: 36 inches from bubbler to finished floor

P-11 FLOOR DRAIN (REGULAR-GENERAL PURPOSE)
- a. Fixture: Jay R. Smith 2005-A-B cast iron floor with sediment bucket and polished nickel bronze top, adjustable, strainer and flashing clamp device. Size of drain as shown on drawings.

P-12 FLOOR DRAIN (EQUIPMENT ROOMS)
- a. Fixture: Jay R. Smith 2233 round, cast iron, 12" diameter drain with sediment bucket, flange and clamp device. Size of drain as shown on drawings.

P-13 TRAP PRIMER (FLOOR DRAIN CONNECTION)
- a. Fixture: Precision Plumbing Products Model P-1 and P-2, sized as required for the number of floor drains served, with trap primer valve and distribution unit.

P-14 WALL HYDRANT (NON-FREEZE, KEY OPERATED)
- a. Fixture: Jay R. Smith #5609-NB "line-gard", anti-siphon non-freeze wall hydrant, cast brass, nickel bronze face, with integral vacuum breaker. Mounting: 18" from center line of hydrant to finished grade.

P-15 HOSE BIBB (COLD WATER - EQUIPMENT ROOMS)
- a. Fixture: Woodford #24P-1/2 with vacuum breaker, rough brass finish.

PART 3 EXECUTION

3.01 INSTALLATION

A. Connect to plumbing fixtures and equipment provided under this and other sections of specification, architectural drawings, and manufacturer's shop drawings. Provide rough-in connections as shown on drawings.

B. Use schedule and details on drawings or manufacturer's shop drawings for connection sizes to fixtures.

C. Connect wall hung urinals to waste piping with red brass nipples.

D. Provide separate p-trap for each fixture, floor drain, and piece of equipment.

E. Provide cast iron p-traps under floor drains.

F. Install barrier free fixtures in accordance with rules and regulations of the Americans with Disabilities Act (ADA).

G. Provide outlet devices which limit the flow of hot water to lavatories and sinks to a minimum of 0.5 GPM, sized as recommended by the manufacturer and as required under ASHRAE Standard 90-75, paragraph 7.7.2 or local or state energy codes.

H. Install lavatories and sinks with a minimum of 4" clearance on each side, from a wall or partition.

I. Install water closets with a minimum of 15" clearance from the centerline of the bowl to each side, from a wall, partition, divider, or another fixture.

J. Water closets shall have a minimum of 21" clearance in front of bowl.

K. Coordinate dimensions required for minimum fixture clearances with other Divisions.

L. Add trap primer connection to floor drain if required. (See drawing for requirement)

M. Caulk around joints at fixtures mounted on wall or floor, or backed up to walls.

N. Mount fixtures rigid to walls as shown on drawings or details.

O. Flush valves: Install flush valves on wide side of water closet as required for ADA accessibility.

P. Run connection size cold water line to back of refrigerator and connect with cutoff valve at connection point. Field verify exact connections required.

3.02 TESTING AND CLEANING

A. Inspect and test all work to insure that it is installed in accordance with drawings and specification and is functioning as designed. Test procedures and pressure as required by other sections.

B. Correct all deficiencies found and retest.

C. Turn all work over to Owner in a clean, sanitary condition.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic materials and methods, along with Division 01, General Requirements, that are applicable to Division 26 sections.

B. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 specification Sections apply to all Division 26 sections.

1.02 QUALITY ASSURANCE

A. Comply with applicable local, state, and federal codes.

B. Warrant electrical Work against faulty material or Workmanship in accordance with Division 01. If the Project is occupied or the systems placed in operation in several phases at the request of the Owner's Representative, then the warranty of each system or piece of equipment used, shall begin on the date each system or piece of equipment was placed in satisfactory operation and accepted as such, in writing, by the Owner's Representative. The use of building equipment for temporary service and testing does not constitute the beginning of the warranty.

C. Equipment and material provided under this Division shall be periodically inspected and serviced by competent mechanics. This function becomes the responsibility of the Owner's Representative when the system is accepted by the Owner's Representative. The one year material and Workmanship warranty is not intended to supplant normal inspection or service and shall not be construed to mean the Contractor shall provide free service for normal maintenance items such as periodic lubrication and adjustment due to normal use, nor to correct without charge, breakage, maladjustment, and other trouble caused by improper maintenance.

D. Turn over electrical equipment provided under this Division to the Owner's Representative in lubricated condition. Include instructions on further lubrication in the operating manual.

E. Upon completion of contract and progressively as work proceeds, clean-up and remove dirt, debris and scrap materials. Maintain premises neat and clean. Protect and preserve access to energized equipment at all times. Clean items with factory finishes. Touch-up minor damage to surfaces; refinish entire piece of equipment when sustained major damage. Use only factory supplied paints of matching color and formula. Schedule an off-hour shutdown of all electrical equipment during the 2-week period preceding substantial completion. During this shut down, clean all buses and insulators inside all switchgear, switchboards, bus ducts, collector buses and panelboards located inside or adjacent to the project limits.

1.03 REGULATORY REQUIREMENTS

A. Perform Work specified in Division 26 in accordance with standards listed below of the latest applicable edition adopted by the authority having jurisdiction. Where these Specifications are more stringent, they shall take precedence. In case of conflict, obtain a decision from the Architect,.
   1. NFPA-70: National Electrical Code
   2. NFPA-72: National Fire Alarm Code
   3. NFPA 90A: Standard for the Installation of Air Conditioning and Ventilating Systems
   4. NFPA 90B: Standard for the Installation of Warm Air Heating and Air Conditioning Systems
   5. NFPA 92A: Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences
   6. NFPA-101: Life Safety Code
   7. NFPA 241: Standard for Safeguarding Building Construction, Alterations, and Demolition Operations
   8. NFPA-780: Standard for the Installation of Lightning Protection Systems
   9. NFPA 5000: Building Construction and Safety Code
   10. ANSI Handicapped Code-A117.1
   11. UL White Book: General information for electrical construction, hazardous location, and electrical heating and air conditioning equipment
   12. International Building Code
   13. State of Tennessee Electrical Code (with all local amendments)
   14. All applicable Occupational Safety and Health Administration (0SHA) Publications, Rules and Regulations.
   15. Americans with Disabilities Act (ADA).

1.04 RELATED WORK SPECIFIED UNDER OTHER DIVISIONS

A. Foundations and pads required for equipment furnished under this Division

B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting

C. Flashing of conduits into roofing and outside walls

D. Heating, ventilating, and air conditioning equipment

E. Plumbing equipment

F. Fireproofing

G. Automatic Doors

H. Cutting and patching for electrical Work, except for errors and omissions under this Division.

1.05 RELATED WORK - OWNER FURNISHED EQUIPMENT AND SYSTEMS

A. Security System Equipment

B. Data Processing System Equipment

1.06 SUBMITTALS

A. Comply with provisions of Division 01.

B. Submit product data, equipment details, capacities, and shop drawings as specified in sections of this Division.

C. Submit fire alarm point-to-point drawings with product data submission.

D. Submit dimensioned equipment room layouts.
   1. Show location of all electrical equipment in rooms including but not limited to:
      a. Electrical rooms and closets
      b. Mechanical Rooms
   2. Draw room layouts to 1/4" scale, with equipment locations shown therein. Clearances shall be in accordance with NEC and local codes. Indicate on drawing the mechanical equipment and mechanical and sprinkler pipe routing.
   3. Electrical equipment submittals will be rejected without dimensioned equipment room or equipment location layouts.

1.07 OPERATING AND MAINTENANCE MANUALS

A. Provide manuals in accordance with Division 01.

B. In addition to required submittals, include copies of all test reports required in Part 3, "Execution" of section 26 05 00.

C. Provide completed warranty certificates for systems and equipment.

D. Provide tabulation of overload heaters, including each motor identified, nameplate data and o/l heater part number.

1.08 DELIVERY AND STORAGE

A. Insofar as possible, deliver items in manufacturer's original unopened packaging. Where this is not practical, cover items with protective materials to keep them from being damaged. Use care in loading, transporting, unloading, and storage to keep items from being damaged.

B. Store items in a clean dry place and protect from damage. Evidence of damage from water or other contaminants will be cause for rejection.

1.09 RECORD DRAWINGS

A. Comply with provisions of Division 01.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Equipment and materials furnished shall be listed by UL or other nationally accredited testing laboratory where available. When listing is not available for a piece of equipment, it shall be submitted in accordance with Drawings and Specifications and shall be approved by the authorities having jurisdiction.

B. Specifications and Drawings indicate name, type and/or catalog number of materials and equipment to establish standards of quality. Submittals shall be based on the standards specified. The standards should not be construed as limiting competition.

C. If materials and equipment other than specified herein are intended to be submitted, a letter providing a list of all the suggested alternates by section number, brand and series or model shall be submitted to the prime Architect for review and approval. Submit in accordance with Division 01 or 14 days prior to bids or final pricing are to be submitted.

2.02 FUSES

A. Provide fuses as scheduled on Drawings for switchboards, power panelboards and disconnecting switches.

B. Acceptable manufacturers: Bussmann; Gould Shawmut; Littelfuse, Inc

C. Provide fuses of one manufacturer only. Place the same type fuse in each pole of a switch.

D. Use these types:
   1. Class J-Time Delay-1A-600A; Switchboards, motor loads
   2. Class J-Fast Acting-1A-600A; Switchboards, other loads
   3. Class RK5-Time Delay-1/10A-600A; Power panels and fusible switches, motor loads
   4. Class RK1-Fast Acting-1A-600A; Power panels and fusible switches, other loads

E. Provide a manufactured fuse storage cabinet, mounted on wall in main electrical room, complete with one set (3 fuses) of spare fuses for each type and rating installed in this Project.

2.03 WALL AND CEILING ACCESS PANELS

A. Style and type as required for material in which installed.
   1. Size: 16" X 16" minimum, as indicated, or as required to allow inspection, service and removal of items served
   2. 14 gauge minimum sheet metal for doors, 16 gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction
   3. Panels shall have spring hinges with screwdriver locks in non-public areas. Key lock, keyed alike, for panels in public areas
   4. Prime painted or rust inhibitive paint finish
   5. UL labeled when in fire-rated construction, 1 1/2 hour rating

6. Provide in walls, floors, and ceilings to permit access to all equipment and junction boxes.
7. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.
8. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers. Use panels equal to Milcor Style M for masonry and drywall construction; equal to Milcor Style K for plastered masonry walls and ceilings. Stainless steel panels shall be used in ceramic tile or glazed structural tile

PART 3 EXECUTION

3.01 COORDINATION

A. Install equipment in accordance with manufacturer's recommendations. Where conflicts occur between Contract Documents and these recommendations, request a ruling before proceeding with such Work.

B. Visit site and observe conditions under which work must be performed. No subsequent allowance will be made because of error or failure to obtain necessary information to completely estimate and perform work required by these documents.

C. Examine Specifications and Drawings to be familiar with items which require electrical connections and coordination. Electrical Drawings are diagrammatic and shall not be scaled for exact sizes.

D. Prior to commencement of installation, prepare coordination drawings for work under this division, as specified in Division 01 and as called for herein. Coordinate work in full cooperation with persons performing work under other divisions, including but not limited to mechanical, plumbing, fire protection, telecommunication and miscellaneous steel to develop these coordination drawings that will serve as the agreed upon plan for a coordinated installation of work for all trades. Include electrical equipment, switchgear, panelboards, starters, disconnect switches, cable tray, conduit racks and conduits 3" and larger on drawings confirming coordination with other trades. Incorporate the information onto the coordination drawings required under Division 01 and 23 to develop master coordination drawings. Account for lighting fixture depths in the coordination. Inform Design Professional of conflicts that cannot be resolved.

E. Drawings are not to be submitted to Engineer. Submit a copy to the General Contractor and keep a copy on site for references. Notify design professional of conflicts that cannot be resolved.

3.02 FEES AND PERMITS

A. Obtain and pay for all necessary permits and inspection fees required for electrical installation.

3.03 TEMPORARY LIGHTS AND POWER

A. Comply with provisions of Division 01.

B. Provide a temporary electrical lighting and power distribution system of adequate size to properly serve the following requirements, including adequate feeder sizes to prevent excessive voltage drop. Temporary Work shall be installed in a neat and safe manner in accordance with the National Electrical Code, Article 305, NFPA 241, and as required by OSHA or applicable local safety codes.

C. Provide one pigtail socket with 150 watt lamp, CFL medium base, for every 1,000 square feet of floor area, evenly distributed throughout the building and with minimum of one pigtail socket per room.

D. Provide suitable guards for temporary lights to prevent accidental contact with lamps.

E. Provide a minimum of one GFCI-protected duplex power outlet for every 1,500 square feet of floor area, evenly distributed throughout the building. Power outlets shall be GFCI-protected duplex 20 amp, 120 volt.

F. Provide feeders, disconnects, connections, etc., required for construction equipment, e.g.: cranes, pumps, etc.

G. Prior to installation, determine if any lighting or power outlets over the minimum quantity noted above are required and if so, provide them.

H. Provide service and panelboards required for above lighting and power outlets.

I. Requirement for payment of utility bills during construction are specified in Division 01.

J. Provide single phase and three phase service as required by Project.

K. Remove temporary wiring upon completion of use.

3.04 CUTTING AND PATCHING

A. Comply with provisions of Division 01

B. Repair or replace routine damage caused by cutting in performance of Work under this Division.

C. Correct unnecessary damage caused due to installation of electrical Work, brought about through carelessness or lack of coordination.

D. Holes cut through floor slabs shall be core drilled with drill designed for this purpose. All openings, sleeves, and holes in slabs between floors shall be properly sealed, fire proofed and water proofed.

E. Holes cut through walls shall be drilled or cut with tools designed for the purpose. All openings, sleeves and holes in walls that extend to underside of floor above shall be properly sealed and fire proofed.

F. Repairs shall be performed with materials which match existing materials and be installed in accordance with appropriate sections of these Specifications.

G. Contractor shall not be permitted to cut or modify any structural members without the written permission of the Architect.

3.05 TRENCHING, EXCAVATION, BACKFILLING, AND REPAIRS

A. Comply with provisions of Division 31.

B. Provide trenching, excavation, and backfilling necessary for performance of Work under this Division.

C. Provide sheathing, shoring, dewatering, and cleaning necessary to keep trenches and their grades in proper condition for Work to be performed.

D. Trenching and excavation shall be unclassified. No extra will be paid in event that rock is encountered.

3.06 FOUNDATIONS AND PADS

A. Provide concrete foundations and pads for equipment per the requirements Division 03. Locate and size foundations, pads, and anchor bolts as required for equipment in this Division.

B. Provide concrete foundations and pads as required for electrical utility company's equipment such as transformers, CT cabinets, metering cabinets, switches, fused disconnects, and circuit breakers. All work shall be in compliance with the utility company's specifications.

3.07 CONTROL SYSTEMS AND INTERLOCK WIRING

A. Control systems, components and control and interlock wiring for mechanical equipment will be furnished under Divisions 22 and 23. Control devices including, but not limited to VFD's, thermostats, fan speed and level control switches, relays and electro-pneumatic switches shall be furnished under Divisions 22 and 23.

B. Provide magnetic starters per section 26 29 13.

C. Provide manual motor starters per Section 26 29 13.

D. Provide power wiring to starters and contactors under Division 26. Power wiring to magnetic starters shall consist of wiring to the line side terminals of the magnetic starter or contactor and wiring away from the load side terminals to the equipment, except where such wiring is installed pre-wired by the equipment vendor.
   1. Power wiring to 120V, 1-phase, 60 Hz and 277V, 1-phase, 60 Hz volt fans, unit heaters, fan-coil units and pumps shall include all portions of the branch circuit, except wiring inside an automatic temperature control panel (ATC) or Direct Digital Control Panel (DDC) or magnetic starter. Such internal wiring shall be furnished under Divisions 22 & 23.

E. Under Division 28:
   1. Furnish duct mounted smoke detectors.

2. Provide wiring among detectors, fire alarm system, magnetic starters and relays, ATC panels and DDC panels

F. See Building Automation System sections of Division 23.

3.08 UTILITY COMPANY COORDINATION

A. Coordinate with the serving utility company as to all types of work required to be done by the contractor for utility equipment.

B. Confirm exact location of point of common coupling, duct banks, pads, etc.

C. Obtain copies of all pertinent utility company specifications relating to duct banks, concrete pads, raceways, and cable that are contractor installed for the utility company use. Maintain copies at project site.

D. Install at components in compliance with utility company specifications and project specifications.

3.09 TESTING ELECTRICAL SYSTEMS

A. On completion of work, installation shall be completely operational and entirely free from grounds, short circuits, and open circuits. Perform operational tests as required to demonstrate substantial completion of the Work. Balance circuits so that feeders to panels are not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests. All ampere readings shall be made with a true RMS reading meter.

B. Perform megger tests of all service entrance circuits, feeder and branch circuits size #4 AWG and larger. Provide a report of all such megger test results.

C. Furnish the DESIGN PROFESSIONAL a copy of test reports and required certification including but not limited to the following:
1. Service ground resistance test
2. Switchboard and panelboard load test - include ampere readings of all panels and major circuit breakers
3. Ground Fault Test
4. Fire Alarm System Certification
5. Megger test results
6. Power System Analysis Report

D. Prior to final observation and acceptance test, install all electrical systems and equipment complete and in satisfactory operating condition.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide a complete system of conductors for lighting, power, and systems throughout the project.

1.02 RELATED WORK

A. Section 26 05 33: Raceways and Boxes for Electrical Systems

B. Section 26 05 43: Underground Ducts and Raceways for Electrical Systems

1.03 REFERENCES

A. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

B. ANSI/UL 83 - Thermoplastic-Insulated Wire and Cables

C. NFPA 70 - National Electrical Code, latest edition

1.04 SUBMITTALS

A. Submit the data sheets for products furnished under this Section.

1.05 DELIVERY, STORAGE AND HANDLING

A. Provide factory-wrapped waterproof flexible barrier material for covering wire and cable wood reels, where applicable, and weather resistant fiberboard containers for factory packaging of cable, wire and connectors, to protect against physical damage in transit. Damaged cable, wire or connectors shall be removed from project site.

B. In their factory-furnished coverings, store cable, wire and connectors in a clean, dry indoor space, which provides protection against the weather.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. American Insulated Wire

B. United Copper

C. Encore

D. Republic Wire

E. Southwire

F. Superior Essex

G. Cerrowire

2.02 CONDUCTORS

A. Provide 98% conductivity copper conductors with 600V insulation.

B. For conductors No. 12 AWG and No. 10 AWG, provide solid type THWN or THHN.

C. For conductors No. 14 AWG and smaller, provide solid type THHN.

D. For conductors No. 8 AWG and larger, provide stranded type THHN, or THWN applied consistently with insulation ratings and NEC requirements.

E. Provide white or gray colored neutral conductors; provide color coded phase conductors.

F. Minimum conductor size shall be:
   1. #12 for power wiring
   2. #14 for hard wired controls unless otherwise specified

G. Fire alarm wire and cable shall meet the requirements of NFPA 70, Article 760. Where required by code and other sections of the specification, fire alarm wire and cable shall be UL listed as Fire Alarm Circuit Integrity Cable (CI Cable).

H. Provide digital communication, network cabling, and other low voltage systems wiring as directed elsewhere in this specification.

PART 3 EXECUTION

3.01 INSTALLATION

A. Conductors shall be continuous from origin to panel or equipment termination without splices. Where splices and taps are necessary or required, they shall be made in splice boxes.

B. Install pull boxes in circuits or feeders over 100' long.

C. Make splices and connections only in outlet, pull or junction boxes. Twist conductors together before installing wire nuts or connectors.

D. Use powdered soapstone or pulling compound to pull conductors.

E. Deliver conductors to jobsite new and in original wrapping, package or reel.

F. Conductors and connections shall test free of grounds, shorts, and opens.

G. Provide No. 10 wire in lieu of No. 12 wire for any branch circuit in excess of 100 feet (120V) or 150 feet (277V) of circuit length to farthest device to prevent excessive voltage drop.

H. Use Ideal wire nuts, Scotchlok Type Y, R, G, or B connectors for fixture connections at outlet boxes.

I. Make feeder taps and joints with approved compression sleeves. Insulate sleeves with heat shrink tubing, rated 600V, 90 degree C., containing factory applied sealant.

J. Leave a minimum of 8" slack wire in every outlet box whether it be in use or left for future use.

K. Color code conductors as follows:
   1. 120/208 Volt Systems:
      a. Phase A - Black
      b. Phase B - Red
      c. Phase C - Blue
      d. Neutral - White
      e. Ground - Green
      f. Isolated Ground - Green with Yellow stripe
   2. 277/480 Volt Systems:
      a. Phase A - Brown
      b. Phase B - Orange
      c. Phase B - Purple
      d. Phase C - Yellow
      e. Neutral - Gray
      f. Ground - Green

L. Use factory color coded conductors where commercially available. If not available, use black conductors and band with color tape.

M. Install in each branch-circuit panelboard a legend explaining color code for ungrounded conductors.

N. Complete conduit system, including bushings, before pulling wire and cable.

O. Maintain separation of electric light, power, Class 1, 2 and 3 wiring throughout raceway systems. Comply with requirements of NFPA-70, paragraphs 300-3, 725-15 and 725-54.

3.02 FIELD TESTING

A. Visually check wire, cable, and connectors for physical damage and proper installation.

B. Check continuity of wire and cable using a low voltage DC tester.

C. Check for proper torque on all mechanical connections.

D. Perform a 1000 VDC megger test on all 600 volt insulated wire or cable #4 AWG and larger. Check each wire to ground and to all other wires in the same cable or conduit by

connecting each wire not under test together and to ground. Wire or cable shall be disconnected at each end and protected from current leakage during testing.

1. Service entrance circuits and feeder (600A & smaller) circuits and branch circuits
    a. Use either a motor driven (Biddle 359) or a hand crank (Biddle MJ159) megger
    b. Perform a dielectric absorption ratio test using a 60-second test period. Record the megohm readings at 30 seconds and 60 seconds. Calculate the dielectric absorption ratio (60 sec / 30 sec readings) and record

E. Provide 8 copies of the megger test report to the Engineer. The report shall be in a tabulated format and shall include the following as a minimum.
    1. Circuit identification
    2. Type of raceway
    3. Approximate length of circuit
    4. Megohm readings
    5. Polarization index or dielectric absorption ratio
    6. Ambient temperature
    7. Approximate humidity (dry, average, or humid)

F. Results
    1. Acceptable
        a. Megohms greater than (1.6 x 1000 / length)
        b. Polarization index greater than 2.0 or a dielectric absorption ratio greater than 1.4
    2. Questionable (must be discussed with Engineer)
        a. Polarization index 1.0 less than 2.0 or a dielectric absorption ration 1.0 less than 1.4
    3. Unacceptable (wire or cable must be replaced)
        a. Megohms less than (1.6 x 1000 / length)
        b. Polarization index less than 1.0 or a dielectric absorption ration less than 1.0

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. The entire system of raceways and equipment shall be grounded in accordance with Articles 250 and 517 of the National Electrical Code and any local regulation or governing authority.

1.02 SUBMITTALS

A. Submittals are not required for products in this Section.

PART 2 PRODUCTS

2.01 REQUIREMENTS

A. Ground clamps: OZ Electrical Manufacturing Company Type "CG", or equal by Steel City or Appleton.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. General
   1. Clean all conductive surfaces on equipment to be grounded, to assure good electrical continuity.
   2. Effectively bond all grounding conductors to grounding electrodes, equipment enclosures and ground buses.
   3. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.
   4. All conduits shall have separate ground wire installed in accordance with Table 250.122 of the National Electrical Code.

B. Service Equipment/Building Ground:
   1. Bond service equipment to incoming main water line with heavy duty ground clamp in accordance with Article 250.50 of National Electrical Code. Size bonding conductor in accordance with Table 250.66 of National Electrical Code unless larger conductor is indicated on the drawings. Utilize insulated bonding conductor.
   2. Building steel shall be connected to ground bus on main service with a conductor the same as specified above.
   3. The system grounds shall be installed and connected as follows: Lay two 500 MCM bare copper conductors in the footing under one wall of the electrical

equipment room. The two conductors shall be continuous in the footing for a minimum of 25 feet. Connect the grounding conductors to ground bus in service entrance section of main switchboard.

4. Grounding electrode conductors specified herein shall be installed without conduit, in general. Where exposed to potential physical damage, install the conductor in Schedule 80 PVC.

C. Feeder/Branch Circuits:
   1. Provide a separate green grounding conductor in the conduit of feeder circuits for the following equipment, sized in accordance with Table 250.122 of the National Electrical Code:
      a. Panelboards
      b. Switchboards
   2. Install a separate green grounding conductor in same conduit as phase and neutral conductor from panel ground bus to device for branch circuits. Install an equal number of grounding and neutral conductors. Size the grounding conductor in accordance with Table 250.122 of the National Electrical Code.
   3. Bond the receptacle ground pin to its box using a bonding jumper, except where isolated ground receptacles are required.
   4. Flexible conduit will not be approved as a grounding means. Flexible conduit shall have a jumper wire sized to ampacity of branch breaker and connected to conduit system on both ends. This applies to fixtures, motors, controls and other devices.

D. Transformers:
   1. Provide a copper bonding jumper to ground the secondary neutral of transformers. Provide a grounding electrode conductor (sized in accordance with National Electrical Code Table 250.66 for the derived phase conductors) to bond the secondary ground of the transformer to the grounding electrode system including the grounding conductor of the primary feeder, the building steel and a cold water main, 1-1/2 inch or larger. Bond across any dielectric unions between point of connection and domestic water entrance.
   2. Main telephone service equipment grounding means shall include but not be limited to a No. 4 AWG, green, insulated, copper grounding conductor connected to the main electrical service equipment ground bus. Terminate this conductor at the telephone equipment location with an ILSCO NB-350-42-R16 grounding bus mounted on the plywood backboard.

3.02 TEST

A. Ground on main service shall be tested using test equipment similar to a "Biddle" tester. Test data shall be submitted to Owner for approval and such approved test data shall become a part of the Operating and Maintenance Instruction Manual. In no event shall ground resistance exceed 25 OHMS. Additional rods or other means shall be employed when measured resistance exceeds 10 OHMS.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide a system of supporting devices and hangers for support or bracing of conduit, electrical equipment, including safety switches, fixtures, panelboards, outlet boxes, junction boxes, and cabinets.

1.02 RELATED WORK

A. Section 26 05 33: Raceways and Conduit Systems

B. Section 26 05 34: Pull and Junction Boxes

C. Section 26 05 35: Outlet Boxes

1.03 SUBMITTALS

A. Submittals are not required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Erico Products, Inc

B. Steel City

C. Minerallac

D. Rayco Fasteners

2.02 TYPES OF SUPPORTING DEVICES

A. Provide appropriate supporting means as detailed on Drawings.

B. Unless otherwise directed in Specifications or Drawings, provide appropriate supporting devices and hangers for electrical equipment from this list of Caddy fasteners:
   1. "Z" purlin clips - 1-1/4" maximum conduit
   2. Conduit clips - 2" maximum conduit
   3. Beam clamps (rod hanger clamps and vertical flange clamps) for support of threaded rods
   4. Beam clamps (set screw type) - 2" maximum conduit

5. Beam clamps (universal) for support of boxes and combination conduit hanger clamps
6. Combination push-in conduit clips - 1" maximum conduit
7. Combination conduit hanger clamps - 2" maximum conduit
8. Flexible conduit clips - 1" maximum flexible conduit
9. Special combination conduit clips - 1" maximum conduit
10. One hole steel straps
11. Conduit hangers - 4" maximum conduit
12. Combination box/conduit hangers for supporting conduit within 3'-0" of a box are not acceptable

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Secure conduits to within 3 feet of each outlet box, junction box, cabinet and fitting and at intervals not to exceed ten feet in accordance with current edition of the National Electrical Code.

B. Install clamps secured to structure for feeder and other conduits routed against the structure. Use drop rods and hangers to support conduits run apart from the structure.

C. Provide and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures and panelboards.

D. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. (Prepainted or galvanized support material is not required to be painted or repainted.)

E. Use of chains, perforated iron, baling wire, or tie wire for supporting conduit runs will not be permitted.

F. Use of Caddy clips to support conduit to top of t-bar ceiling grid will not be permitted.

G. For support of low voltage wiring not required to be in conduit, Contractor shall bundle cables together in a neat manner using approved nylon tie wraps. Bundled cables shall be supported with "J" hooks on telephone type bridle rings, a minimum of six feet on centers.
   1. Use UL listed Ty-wraps for plenum use in plenum areas.
   2. Maximum supported weight rating of "J" hooks shall not be exceeded.
   3. Identify differing types of cables and tag them with tape indicating service, i.e. telephone, nurse call and dictation.
   4. Identification tape shall be provided at minimum intervals of 25 feet on center and within each individual space.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND CONDUIT SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide a complete conduit system with associated couplings, connectors, and fittings.

1.02 RELATED WORK

A. Section 26 05 29: Hangers and Supports for Electrical Systems

1.03 SUBMITTALS

A. Submittal of products furnished under this Section are not required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. EMT, IMC, and Rigid conduit shall be hot dipped, galvanized, or electro galvanized steel by Allied, General Electric, Republic, Triangle, or Wheatland.

B. PVC conduit shall be Carlon, Schedule 40 or Schedule 80, 90 degrees rated.

C. Associated couplings, connectors and fittings shall be steel as manufactured by Raco or equivalent.

D. Erickson couplings shall be used where neither length of conduit can be rotated.

E. EMT box connectors and couplings shall be compression type.

F. Conduit, connectors, couplings and fittings shall be UL listed and labeled.

2.02 ELECTRICAL METALLIC TUBING (EMT)

A. Use Electric Metallic Tubing (EMT) where drawings call for conduit to be:
   1. Concealed in walls
   2. Installed above suspended ceilings
   3. Installed exposed, above 6 feet

2.03 INTERMEDIATE METAL CONDUIT (IMC)

A. Use Intermediate Metal Conduit (IMC) where drawings call for conduit to be:
   1. Installed for feeders
   2. Installed in hazardous areas

3. Installed in concrete slabs on grade to serve floor boxes, freestanding casework, etc
4. Installed exposed below 6 feet
5. Installed in wet locations

2.04 RIGID STEEL CONDUIT (RSC)

A. Use rigid steel conduit where drawings call for conduit to be:
1. Installed underground
2. For feeders
3. Exposed to severe mechanical damage

2.05 POLYVINYL CHLORIDE (PVC)

A. Use PVC for:
1. Underground service entrance conduits for power
2. Underground service entrance conduits for telephone
3. Exterior branch circuits installed underground
4. Concrete encased ductbanks

2.06 FLEXIBLE METAL CONDUIT

A. Provide flexible metal conduit for termination at equipment subject to motion and vibration.

B. Conduit shall be electrically continuous from outlet or conduit end to utilization equipment.

C. Length shall not exceed 6 feet.

D. Maximum length concealed in walls shall be 3 feet.

E. Where exposed to continuous or intermittent moisture, conduit shall be liquid tight.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Minimum size of conduits shall be 3/4"

B. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors and fittings.

C. Make bends or offsets with standard ells or field bends with an approved bender.

D. Run concealed conduits in direct line with long sweep bends or offsets. Run exposed conduits parallel to and at right angles to building lines. Group multiple conduit runs in banks.

E. Conduit systems shall be electrically continuous.

F. Secure conduits to boxes and cabinets with double locknuts and bushings.

G. Cap ends of conduits to prevent entrance of water and other foreign material during construction.

H. Complete conduit systems before pulling conductors.

I. Support conduits as specified in Section 26 05 29 and in accordance with National Electrical Code.

J. Provide cable supports in conduits rising vertically in accordance with the National Electrical Code, Article 300.

K. Provide insulated bushing on both ends of empty conduits.

L. Conduits which pass through floor slabs (except ground floor) shall be sealed with UL listed fire-stopping materials. Seal around conduits or other wiring materials passing through partitions, which extend to the underside of the slab above, and those passing through smoke partitions and fire rated walls. Use U.L. listed materials to prevent passage of smoke or fire. See Division 7 for specific materials required.

M. Conduits which enter crawl spaces, tunnels, and basements from outside the building shall be grouted-in to prevent entry of gases, vapors, insects or rodents to these spaces from street mains.

N. When four or more, 2 inch or larger conduits, are banked together below the ground floor slab they shall be supported and separated using Carlon, Snap-Loc type spacers. Backfill below, between, and above ducts in such a manner to prevent erosion and restore sub-grade preparation prior to concrete slab pour.

O. Where IMC or RSC conduit is installed in a cabinet, junction box, pull box or auxiliary gutter, conductors shall be protected by insulated bushings. Locknuts shall be installed on conduit outside and inside enclosure.

P. Install seal-off fittings in conduits entering hazardous areas and conduits entering cold temperature areas, such as freezers and refrigerators.

Q. Use expansion fittings or flexible conduit, properly bonded, to ensure ground continuity across expansion joints in floors and ceilings.

R. Terminate conduits for feeders and branch circuits directly into panelboard enclosures from which they are served without the use of pull boxes, junction boxes, wire ways, or auxiliary gutters. If the panelboard enclosure does not provide sufficient surface area for all conduits, notify the Engineer and request directions.

S. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit, and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.

T. Conduits shall be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.

U. Where feeder or branch conduits enter pull boxes or junction boxes, clearly mark on conduit on the entering and leaving side of each box the panel name and circuit number(s) contained within the conduit using a permanent black marker.

3.02 PVC

A. Provide 1/4" nylon pull rope in all primary power and incoming telephone service entrance conduits.

B. Use rigid, PVC schedule 80, encased in concrete where called for on drawings, for emergency power circuits and normal power circuits not serving patient care areas.

C. No PVC shall emerge from the ground or the concrete slab or encasement. PVC shall convert to galvanized rigid metal prior to penetrating slab or exiting concrete encasement.

D. Make bends with standard ells or with an approved bender. A blow torch shall not be used.

3.03 FLEXIBLE METAL CONDUIT

A. Conduits shall be 3/8" minimum size for lighting fixtures and 1/2" minimum size for utilization equipment other than lighting fixtures.

B. Fittings shall be made of either steel, or malleable iron only.

C. A copper ground wire shall be installed as a jumper around flexible conduit. The jumper may be installed inside of flexible conduit or outside of conduit to ensure continuity of ground.

D. Recessed lighting fixtures shall be connected with flexible metallic conduit from outlet box to fixture.

E. Install liquid tight flexible conduit in such a manner as to prevent liquids from running on the surface toward fittings.

F. Allow sufficient slack conduit to reduce the effect of vibration.

END OF SECTION

SECTION 26 05 34

PULL AND JUNCTION BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide pull and junction boxes of appropriate size and depth as indicated on the drawings and as specified hereinafter.

1.02 RELATED WORK

A. Section 26 05 29: Hangers and Supports for Electrical Systems.

B. Section 26 05 33: Raceways and Conduit Systems.

C. Section 26 05 53: Identification for Electrical Systems.

1.03 SUBMITTALS

A. Submit product data for each type of box used in exterior work.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. For interior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4" flanges and screw covers.

B. For exterior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4" flanges, bolted covers with full gaskets forming a completely rain tight assembly, equal to Keystone 19000, and 37900 series.

C. For exterior work in graded areas outside the building, provide heavy duty sidewalk junction boxes externally flanged for flush mounting. Covers shall be fully gasketed, watertight and secured with stainless steel screws or bolts equal to Quazite type PC.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Provide junction boxes as shown on drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4" square and 2-1/8" deep.

B. Provide screw covers for junction boxes.

C. Install boxes in conduit runs wherever necessary to avoid excessive runs or bends. Do not exceed 100' runs without pull boxes.

D. Rigidly secure boxes to walls or ceilings. Conduit runs will not be considered as adequate support.

E. Install boxes with covers in accessible locations. Size boxes in accordance with Articles 314 of the National Electrical Code.

F. Do not install pull or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box.

END OF SECTION

SECTION 26 05 35

OUTLET BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide each fixture, switch, receptacle, and other wiring device with a galvanized outlet box of appropriate size and depth for its particular location and use.

1.02 RELATED WORK

A. Section 26 05 29: Hangers and Supports for Electrical Systems.

B. Section 26 05 33: Raceways and Conduit Systems.

C. Section 26 05 53: Identification for Electrical Systems.

1.03 SUBMITTALS

A. Submittal of products furnished under this Section is not required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. National

B. Appleton.

C. Raco.

D. General Electric.

E. Steel City.

2.02 SUPPORTING DEVICES

A. Provide appropriate supporting devices for outlet boxes by Caddy Fasteners or equal as follows:
   1. "RB" box mounting brackets.
   2. Screw gun box brackets.
   3. "H" box mounting brackets.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Locate boxes to prevent moisture from entering or accumulating within them.

B. Support outlet boxes independently of conduit, as required by the National Electrical Code.

C. Provide 4" octagonal x 1-1/2" deep ceiling outlet boxes. For increased cubic capacity, provide 4" octagonal x 2-1/8" , 4" square x 1-1/2" or 4-11/16" square x 2-1/8" ceiling outlet boxes.

D. Provide 4" square X 1-1/2" deep boxes for switch and receptacle outlets in drywall partitions. Use square cut plaster rings installed within 1/4" of finished wall.

E. Provide 4" square x 2-1/2" deep boxes for telephone/data outlets in drywall partitions. Use square cut plastic rings installed within 1/4" of finished wall.

F. Where required to hang a specified fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.

G. Provide 2-1/2" x 3-3/4" one gang masonry boxes for switches and receptacles installed in concrete block walls not plastered. For increased cubic capacity, provide 3-1/2" x 3-3/4" one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4" square boxes with square cut device covers not less than 1" deep specifically designed for this purpose. Use round edge plaster rings only if the block walls are to be plastered. Use sectional or gangable type outlet boxes only in drywall construction.

H. Provide 4-11/16" square X 2" deep outlet boxes with square cut device corners for block walls or round edge plaster rings for plastered walls for telephone outlets, data outlets, and private intercom interphones. Single gang device boxes are not acceptable.

I. Provide fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlets only for ceiling fixture outlets. Provide condulets with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere, damage, or mar the appearance of the installation.

J. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed in compliance with Article 314 of the NEC.

K. Effectively close unused openings in boxes with metal plugs or plates.

L. Set boxes so that front edges of device extensions, plaster rings, etc are flush with finished surfaces.

M. Caddy "H" type box mounting brackets shall not be used on exterior walls, chase walls, or in any other installation where the backside of the stud wall will not be finished. Do not use 4" brackets in thicker stud walls which will not provide adequate bracing.

N. Secure boxes to surfaces upon which they are mounted or embed boxes in concrete masonry. Support boxes from structural members with approved braces.

O. Install blank device plates on outlet boxes left for future use.

P. Provide bushings in holes through which cords or conductors pass.

Q. Install boxes so that the covers will be accessible at all times.

R. Electrical outlet boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings occur on one side only in each framing space, that openings do not exceed sixteen square inches and that boxes on opposite faces of a partition are separated horizontally not less than 24 inches. All clearances between such outlet boxes and the gypsum board shall be completely filled with joint compound or approved fire-resistive compound. The wall shall be built around outlet boxes larger than sixteen square inches so as not to interfere with the wall rating.

S. Install outlet boxes on opposite sides of the same wall offset to avoid back to back mounting where possible.

END OF SECTION

SECTION 26 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with provisions of Sections 26 05 00.

B. Concrete encased underground non-metallic conduit duct bank.

1.02 REFERENCES

A. ANSI C2-97, National Electrical Safety Code.

B. NEMA TC 2-90, Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

C. NEMA TC 3-90, PVC Fittings for Use with Rigid PVC Conduit and Tubing.

D. UL 651_89, UL Standard for Safety - Schedule 40 and 80 Rigid PVC Conduit.

1.03 SUBMITTALS

A. Products furnished from listed manufacturers are pre-approved and require no submittal.

B. Submit proposed substitutions for approval.

C. Submit for information as-built drawings indicating accurate routing of underground duct banks.

1.04 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by UL as suitable for purpose specified and shown.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products. Protect on-site storage from weather.

B. Accept conduit on-site. Inspect for damage.

C. Protect nonmetallic conduit from entrance of debris, and provide appropriate covering to protect from sunlight.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carlon

B. Allied Tube and Conduit

2.02 RIGID NON-METALLIC CONDUIT

A. Rigid PVC Conduit: NEMA TC 2; UL 651 listed; Schedule 40.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.03 CAST-IN-PLACE CONCRETE

A. Concrete: Refer to Division 03.

B. Concrete shall have minimum 28-day strength of 3,000 psi.

C. Reinforcement: Duct banks under concrete or pavement and subject to traffic shall be reinforced. The reinforcement shall extend a minimum of 10 feet from edge of concrete or pavement.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify routing and termination locations of conduit duct bank prior to excavation.

B. Verify field measurements.

C. Verify conduit is anchored prior to placing concrete.

3.02 PREPARATION

A. Excavate, trench, and prepare site for underground conduit duct bank installation.

3.03 INSTALLATION

A. Where necessary to cut conduit, use saw or pipe cutter; ream cut ends. Bring conduit to shoulder of fittings; fasten securely.

B. Join nonmetallic conduit using cement recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

C. Use suitable separators and chairs installed not greater than 4 ft on centers. Band conduit together with suitable banding devices. Anchor conduit to prevent movement during concrete placement.

D. Stagger conduit joints in concrete encasement 6 in. min, vertically.

E. Install conduit with minimum grade of 3-inches/100 ft. (Only required where conduit terminates at a manhole.)

F. Depth: Per ANSI C2; top of duct bank 18 in. minimum, 30 inches maximum below finished grade unless approved by the Engineer.

G. Terminate conduits with Termi-Duct type end bells at manhole entries.

H. Use suitable caps to protect installed conduit from entrance of dirt and moisture.

I. Duct banks installed under grass and other non-traffic areas do not require any additional reinforcement steel. Duct banks installed below load bearing building concrete slabs may need to be reinforced and must be coordinated with the general contractor.

J. Duct banks installed under concrete or pavement subject to vehicular traffic shall be reinforced in the following manner.
   1. Place #4 steel rebar in the top and both sides of the duct bank in the horizontal plane and lengthwise direction. There shall be one rebar in each corner with a maximum distance of 8 inches between rebars.
   2. Place a "U" shaped stirrup fabricated from #4 rebar in the vertical plane every 3 feet in the lengthwise direction.
   3. Rebar shall be tied together in an acceptable manner using standard steel tie wire.
   4. All rebar shall have a minimum concrete cover of 2 inches.

K. Pour concrete into formed bank of conduits. Provide a minimum of 3 inches of concrete cover at bottom, top, and sides of conduit duct bank. Vibrate concrete with a mechanical vibrator to ensure proper concrete fill and elimination of voids.

L. Uniformly dust red iron oxide over top of freshly poured concrete at the rate of 1 lb/yd of surface.

M. Duct banks shall be backfilled in the following manner.
   1. Duct banks installed under grass and other non-traffic areas shall be backfilled with clean suitable earth. The earth shall be compacted sufficiently to prevent any settlement.
   2. Duct banks installed under concrete or pavement subject to vehicular traffic shall be backfilled with #57 (3/4") washed limestone gravel. The gravel shall be compacted sufficiently to prevent any settlement. Coordinate with general contractor to ensure suitability for the concrete or pavement cover.

END OF SECTION

SECTION 26 05 44

PREFABRICATED CONCRETE MANHOLE

PART 1 GENERAL

1.01 WORK INCLUDED

A. This specification prescribes the minimum design and installation criteria to be applied when designing, manufacturing, and installing sectional pre-cast concrete electrical manholes.

B. The manhole shall be supplied in two sections. The size shall be 10'x 10' x 7' unless noted otherwise on the drawings. (Inside dimensions) The minimum wall thickness shall be 6 inches.

C. Comply with section 26 05 00.

D. Provide, install, and place in service all electrical manholes as indicated on the drawings and contract documents.

1.02 RELATED WORK

A. Section 26 05 43: Underground Ducts and Raceways for Electrical Systems

B. Section 26 05 13: Medium Voltage Cable

C. Section 26 05 19: Low Voltage Electrical Power Conductors

1.03 SUBMITTALS

A. Product data sheets on each type of manhole.

B. Drawings for each type and size manhole. Minimum size drawing shall be "C" (11" x 17").

1.04 QUALITY ASSURANCE

A. Each manhole manufacturer shall provide adequate documentation of a Quality Assurance program that will provide reasonable assurance that the manholes will be manufactured in accordance with this specification and all applicable industry standards and specifications.

1.05 CODES AND STANDARDS

A. American Concrete Institute.
   1. ACI-318 Building Code Requirements for Reinforced Concrete.

B. American Society for Testing Materials (ASTM)
   1. A615 -Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   2. A706 -Low-Alloy Steel Deformed Bars for Concrete Reinforcements.

3. C31 --Making and Curing Concrete Test Specimens in the Field.
4. C33 --Concrete Aggregates.
5. C39 --Compressive Strength of Cylindrical Concrete Specimens.
6. C94 --Ready Mixed Concrete.
7. C143 -Slump of Portland Cement Concrete.
8. C150 -Portland Cement.
9. C260 -Air-Entraining Admixture for Concrete.
10. C494 -Chemical Admixtures for Concrete.
11. C857 -Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
12. C858 -Underground Precast Concrete Utility Structures.
13. C891 -Installation of Underground Utility Structures.

C. American Welding Society (AWS).
1. D1-4, Structural Welding Code (reinforcing steel).
2. D-12, Recommended Practices for Welding Reinforcing Steel.
3. The manhole installation shall comply with the latest issue of the National Electrical Code, the National Electrical Safety Code, and all applicable local and state requirements.

PART 2 PRODUCTS

2.01 DESIGN LOADS

A. Design loads shall consist of dead loads live loads, and impact loads, Dead loads include hydrostatic pressure due to the water table assumed to be at three (3) feet. Live loads are designed for H-20 and/or H-20-44 traffic loads (16,000lb. wheel load). The dead load is considered to be the worst condition with the water table located at 3'-0" below the surface.

B. Precast concrete electrical manholes are to be designed in accordance with the American Association of State Highway and Transportation Officials (MSHTO), the American Society for Testing Materials (ASTM C-857), and the American Concrete Institute (ACI 318), as last revised. The electrical manholes are to be fabricated in accordance with ASTM C-658, customer drawings, and specifications.

2.02 FORMS

A. All forms used for the placement of concrete are of metal and structurally designed and constructed to maintain their alignment under the extreme pressure of the concrete during placement.

2.03 MATERIALS

A. Concrete
1. Portland cement shall conform to ASTM C150, "Specifications for Portland Cement" as last revised and shall be type II, low alkali Portland cement.
2. Fine Aggregates shall conform to the requirements of ASTM C-33 "Specifications for Concrete Aggregates". These fine aggregates shall be properly graded and free of any deleterious materials to produce a homogenous concrete matrix when mixed with cement.

3. Coarse Aggregates shall conform to the requirements of ASTM C-33, "Specifications for Concrete Aggregates". The maximum size of aggregate shall conform to those requirements specified in the mix design. These aggregates shall be properly graded and free of any deleterious materials to produce a homogenous concrete matrix when mixed with cement.
4. Lightweight aggregates shall conform to the requirements of ASTM C-330, Specification for Structural Concrete".
5. Water used in mixing concrete shall be potable, free from deleterious amounts of oils, acid, alkalis, salts, organic materials, or other substances which may adversely affect the properties of the concrete Non-potable water may be used as mixing water provided that the mortar cubes made with non-potable water have a seven day strength (equal to no less than 90% the strength) of mortar cubes made with potable water.

2.04 ADMIXTURES SHALL CONFORM TO THE APPLICABLE SPECIFICATIONS AS FOLLOWS

A. ASTM C-260 - Chemical Admixtures for Concrete

B. ASTM C-494 - Fly ash and raw or calcined natural Pozzolan for use as a mineral admixture in Portland Cement Mix

C. ASTM C-618 - Pigments for integrally colored Concrete

2.05 REINFORCEMENT

A. All reinforcement steel, including welded wire mesh, shall be of the size and in the location as shown on the plans. All reinforcing shall be sufficiently tied to withstand any displacement during the pouring operation. All bars shall be intermediate grade, or as specified, billet steel conforming to ASTM A-615 or A-706 as required.

B. Steel reinforcing bars shall conform to those requirements set forth in the following specifications:
1. Specification for Deformed and Plain Billet Steel for Concrete Reinforcement" including supplemental requirements, ASTM A615 (Including SI).
2. Low Alloy Steel Deformed Bars for Concrete Reinforcement", A-706.
3. "Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement", ASTM A-185.

2.06 COMPRESSIVE STRENGTH

A. Sufficient cement content shall be used as to produce a minimum compressive strength of 4500 PSI at 28 days.

2.07 BATCHING

A. A central batching facility shall be used to assure accurate weighing and mixing of materials to obtain a suitable concrete mix.

2.08 PLACING

A. Concrete shall be made by properly proportioned parts of sand, aggregate, and cement with sufficient water to produce concrete mix of uniform quality and slump. Handling from the mixer or the transport vehicle to the forms for deposit will be in a continuous manner, as rapidly as practicable without segregation or loss of ingredients, until the unit or segment pouring is completed. Compaction by either external or internal mechanical vibration shall be used during the placement of the concrete mix.

2.09 CURING

A. Concrete while still in the forms may be steam cured after an initial set has taken place. Steam temperature shall not exceed 160 degrees Fahrenheit, and shall not be increased from ambient temperature at a rate exceeding 40 degrees Fahrenheit per hour. Steam curing shall be considered complete after sufficient time has elapsed to produce adequate strength to withstand any structural strain that may be subjected during the form stripping operation.

B. Additional curing may be applied by means of water spraying or membrane curing compound to reach the ultimate strength requirements.

2.10 WATER PROOFING

A. Butyl Rubber, SS-S-00210 shall be used as a joint sealant at all construction joints.

2.11 MANHOLE COVER

A. Cover shall be cast iron, USF 640, 770 pounds. The diameter shall be 40". It shall be inscribed with "ELECTRICAL".

B. The covers shall be fastened by a minimum of two penta-head type bolts 1/2 inch in diameter to prevent unauthorized removal.

2.12 CONDUIT FITTINGS

A. Term-A-Duct conduit inserts shall be installed per the drawings. They shall be sized for 5" Schedule 40 PVC conduit unless noted otherwise on the drawings. Unless otherwise noted on the drawings, the center-to-center distance shall be 7.5 inches. The minimum distance from edge of duct to a wall or construction joint shall be 6 Inches. Unless otherwise noted on the drawings, the duct group shown shall be installed in the center of each wall of each section of the manhole. There shall be at least two spare inserts in each side whether shown or not.

2.13 ANCHORS

A. 1/2" inserts shall be installed as required to facilitate installation of cable support racks. Inserts shall be installed a minimum of 18" centers horizontally and 12" centers vertically.

2.14 SUPPORTS

A. Metal support racks shall be installed every 18" horizontally and 12" vertically to properly support the cable. Supporting arm width and number of levels shall be determined by number of circuits.

2.15 PULLING IRONS

A. Imbedded pulling iron shall be installed in the floor of the manhole on all four sides.

2.16 GROUNDING

A. Each manhole shall have an opening in the bottom corner for a 3/4-inch ground rod. In addition, at each duct bank entrance, there shall be an opening for a 4/0 AWG bare copper wire.

B. A 4/0 bare copper wire shall be installed completely around the inside walls to provide for grounding of cable splices, support racks, etc. The wire shall be connected to the 4/0 bare wire in each duct bank and to the ground rod.

2.17 MANUFACTURER

A. Oldcastle Precast is the approved manufacturer. Products equal in all aspects from other manufacturers will be considered if they are submitted for approval no less than 10 days before bid date.

B. Vendor drawings will be submitted for approval before manufacturing is begun.

PART 3 EXECUTION

3.01 MANHOLES SHALL BE INSTALLED IN THE FOLLOWING MANNER

A. The manhole shall be installed so that the top of the concrete cover is 6 inches below the ground elevation. This will allow the top of the steel manhole cover to be 4 inches above the ground elevation. Note that the ground should be rounded up to be flush at the manhole cover location and sloped away in a minimum 20-foot circle to provide proper drainage away from manhole cover.

B. If the manhole is installed in a street or other paved or concrete area, the manhole cover must be flush with the finished pavement or concrete.

C. The hole shall be excavated to a depth at least 6 inches deeper than required for the proper elevation of the manhole and this excess depth filled with 1/2-inch gravel and compacted to a density sufficient to support the manhole without any settling. A pneumatic compactor shall be used.

D. The earth shall be back-filled around the manhole and compacted before trenching for the duct banks begins.

E. Raceway numbers shall be stenciled above each conduit entrance with minimum 3-inch high letters.

F. The ground rod and grounding cable openings shall be sealed after all devices are installed.

G. Ballast weight shall be added to manhole where required to prevent floating due to water pressure.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Requirements for identification of electrical equipment, circuit identification, system color coding and warning signs.

1.02 RELATED WORK

A. Section 26 05 00: Common Work Results for Electrical

1.03 SUBMITTALS

A. Submittal of product furnished under this section is not required.

PART 2 PRODUCTS

2.01 IDENTIFICATION OF EQUIPMENT

A. Identify electrical equipment with permanently attached phenolic plates with 1/4" white or black engraved lettering on the face of each, attached with two sheet metal screws. Provide nameplate colors as specified in other parts of this section.

B. Include the following information on panelboard identification plates:
   1. Panel Name
   2. Name of panel serving it
   3. Voltage and Phase

2.02 CIRCUIT IDENTIFICATION

A. Identify feeder j-boxes and pull boxes with designation of panelboard/switchboard source as "FROM" and load served as "TO" with permanent labels.

B. Identify pull and junction boxes with the designation of panelboard and the circuit number of each circuit contained therein, with permanent marker. Clearly mark information on or in the box, not on the cover, so that the information is easily identifiable.

C. Identify circuits in conduits entering outlet boxes with the designation of panelboard and the circuit number of each circuit contained therein, with permanent marker.

2.03 COLOR CODE IDENTIFICATION

A. Color code phenolic plates utilized to identify electrical equipment according to which branch of the electrical system the equipment is connected to as follows:
   1. Normal - Black with white letters.
   2. Fire Alarm - Red with white letters.

B. If existing equipment identification nameplates are a different color, request a ruling from the design professional to determine what color scheme to follow.
   1. Fire Alarm System - Red

2.04 WARNING SIGNS

A. Provide warning signs called for by NFPA 70, by OSHA and by the list included below.

B. Use Seton Name Plate Company products, 10" x 7" size, pressure-sensitive (PSPL) for indoor use, 30 ga. baked enamel for outdoor use (30 BE) with style numbers shown below.

C. Danger - Electrical Hazard - Authorized Personnel Only, Style No. 161.
   1. Main electrical room(s),
   2. Electrical equipment closet(s).

PART 3 EXECUTION

3.01 INSTALLATION

A. Identify the following electrical equipment as called for herein:
   1. Switchboards, switchgear, and individual devices installed in them.
   2. Panelboards.
   3. Safety switches and disconnects.
   4. Contactors and motor starters.
   5. Cabinets:
      a. Fire Alarm Cabinets
      b. Lighting Control Cabinets
   6. Individually mounted circuit breakers.
   7. Relays.
   8. Shunt trip pushbuttons:
      a. Main Service Disconnects.
      b. Computer Power
      c. Computer HVAC power.
   9. Transformers. Starters and relays connected under this Division shall be identified whether furnished under this Division or under other Divisions.

END OF SECTION

SECTION 26 05 73

POWER SYSTEM ANALYSIS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Short-circuit and protective device coordination studies as prepared by the electrical equipment manufacturer or a professional electrical engineering firm.

B. Arc Flash Hazard Analysis Study per the requirements set forth in NFPA 70E - Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according IEEE 1584.

C. The studies shall include all new electrical distribution equipment supplied under this contract.
   1. Include all directly affected existing distribution equipment including emergency equipment at the customer facility.
   2. Include all existing distribution equipment including emergency equipment at the customer facility.

1.02 RELATED SECTIONS

A. Section 26 05 00: Common Work for Electrical

B. Section 26 24 13: Switchboards

C. Section 26 24 16: Panelboards

1.03 REFERENCES

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
   1. IEEE 141 - Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
   2. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
   3. IEEE 399 - Recommended Practice for Industrial and Commercial Power System Analysis
   4. IEEE 241 - Recommended Practice for Electric Power Systems in Commercial Buildings
   5. IEEE 1015 - Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems
   6. IEEE 1584 - Guide for Performing Arc-Flash Hazard Calculations

B. American National Standards Institute (ANSI):
   1. ANSI C57.12.00 - Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
   2. ANSI C37.13 - Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures

3. ANSI C37.010 - Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
4. ANSI C 37.41 - Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories

C. The National Fire Protection Association (NFPA)
1. NFPA 70 - National Electrical Code
2. NFPA 70E - Standard for Electrical Safety in the Workplace

1.04 SUBMITTALS FOR REVIEW/APPROVAL

A. Submit a preliminary short-circuit and protective device coordination study to the design engineer prior to receiving final approval of the shop drawings and/or prior to release of equipment drawings for manufacturing. The preliminary study shall provide sufficient data to ensure that the selection of equipment will have adequate ratings and the protective device trip characteristics will be satisfactory.

B. Submit the final short-circuit and protective device coordination analysis at the end of the construction cycle when circuits are installed and all equipment is on site and/or installed such that complete and accurate data may be obtained.

C. Submit the arc flash hazard analysis at the end of the construction cycle when circuits are installed and all equipment is on site and/or installed such that complete and accurate data may be obtained.

1.05 SUBMITTALS FOR CONSTRUCTION

A. The results of the final short-circuit, protective device coordination, and arc flash hazard (if required) analysis studies shall be summarized in a final report. No more than five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short-circuit input and output data. Additional copies of the short-circuit input and output data, where required, shall be provided on CD in PDF format.

B. At the owner's option, the contractor is required to provide the study project files to the Owner in electronic format including all project files, libraries, etc to allow the owner to update and to print additional copies, labels, etc.

C. If the owner does not use the applicable computer program, a copy of the computer analysis software viewer program is required to accompany the electronic project files, to allow the Owner to review all aspects of the project and print arc flash labels, one line diagrams, etc.

D. The report shall include the following sections:
1. Executive Summary.
2. Descriptions, purpose, basis and scope of the study.
3. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short circuit duties.

4. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip unit settings, and fuse selection.
5. Fault current calculations including a definition of terms and guide for interpretation of the computer printout.
6. Details of the incident energy and flash protection boundary calculations.
7. Recommendations for system improvements, where needed.
8. One line diagram.
9. Equipment specific arc flash labels.

E. If the power systems study submittal is not approved following the second submittal, the contractor shall pay the Project Engineer $200.00 per hour to review additional submittals until the study is approved.

1.06 QUALIFICATIONS

A. The short-circuit, protective device coordination and arc flash hazard analysis studies (if required) shall be conducted under the supervision and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.

B. The Registered Professional Electrical Engineer shall be a full-time employee of the electrical equipment manufacturer or a professional electrical engineering firm.

C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

D. The equipment manufacturer or approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting a detailed plan outlining the steps to be taken to ensure a proper outcome (if required).

1.07 COMPUTER ANALYSIS SOFTWARE

A. The studies shall be performed using the latest revision of the SKM Systems Analysis Power*Tools for Windows (PTW) software program. Other commercially available products may be considered under certain circumstances.

PART 2 PRODUCT

2.01 STUDIES

A. Furnish short-circuit and protective device coordination studies as prepared by the electrical equipment manufacturer or a professional electrical engineering firm.

B. Furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace.

2.02 DATA COLLECTION

A. Contractor shall furnish all data as required by the power system studies. The Engineer performing the short-circuit, protective device coordination, and arc flash hazard analysis studies (if required) shall furnish the Contractor with a list of required data immediately

after award of the contract. The Contractor shall expedite collection of the data to ensure completion of the studies as required.

B. The engineer performing the study shall make at least one job site visit before completion of the final study to familiarize himself/herself with the project to ensure that the provided data is accurate.

C. Source contribution shall include present and future motors and generators.

D. Load data utilized shall include existing and proposed loads obtained from Contract Documents provided by Owner, or Contractor.

E. If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.03 SHORT-CIRCUIT STUDY

A. Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standard 141.

B. Estimated conductor lengths, typical generator, transformer, motor, and utility data may be used for the preliminary study.

C. Actual installed conductor lengths, test and/or nameplate data for all generators, transformers, motors 50 HP and larger, capacitors, reactors, or other equipment that may affect the study must be used for the final study.

D. Actual utility fault current and X/R ratio shall be used Infinite bus calculation is not acceptable.

E. The pre-fault bus voltage shall be the highest reported by the utility for past 5 years. If unavailable, 1.05 per unit shall be used.

F. Provide the following:
   1. Calculation methods and assumptions.
   2. Selected base per unit quantities.
   3. One line diagram of the system being evaluated.
   4. Utility impedance data, including the maximum and minimum 3 phase and line-to-ground fault current available, nominal, maximum, and minimum voltage, 3 phase X/R ratio line-to-ground X/R ratio.
   5. Utility protective device settings including recloser if used.
   6. Motor fault contribution characteristics.
   7. Generator fault contribution characteristics.
   8. Tabulations of calculated quantities.
   9. Results, conclusions, and recommendations.

G. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:
   1. Electric utility's supply termination point
   2. Incoming switchgear
   3. Unit substation primary and secondary terminals

4. Low voltage switchgear.
5. Motor control centers.
6. Standby generators and automatic transfer switches.
7. Branch circuit panelboards.
8. Other significant locations throughout the system.

H. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.

I. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to short circuit ratings.
2. Adequacy of switchgear, switchboards, disconnects, transfer switches, motor control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Notify Owner, in writing, of any existing circuit protective devices improperly rated for the calculated available fault current.

2.04 PROTECTIVE DEVICE COORDINATION STUDY

A. Proposed protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs. No more than 5 devices shall be shown on any plot.

B. Include on each TCC graph, a complete title, applicable notes, and one-line diagram with legend identifying the specific portion of the system covered.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the TCC graphs, where applicable:
1. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
2. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
3. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves. The frequent fault portion of the damage curve should not be shown unless the transformer feeds overhead lines. The shifted curve for line-to-ground faults on the secondary side shall be shown on the ground fault plot.
4. Conductor damage curves.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

2.05 REPORT SECTIONS

A. Input data shall include, but not be limited to the following:
1. Feeder input data including feeder type (cable or bus), size, length, number per phase, conduit type (magnetic or non-magnetic) and conductor material (copper or aluminum).

2. Transformer input data, including winding connections, secondary neutral-ground connection, primary and secondary voltage ratings, KVA rating, impedance, % taps and phase shift.
3. Reactor data, including voltage rating, and impedance.
4. Generation contribution data, (synchronous generators and Utility), including short-circuit reactance (X"d), rated MVA, rated voltage, three-phase and single line-ground contribution (for Utility sources) and X/R ratio.
5. Motor contribution data (induction motors and synchronous motors), including short circuit reactance, rated horsepower or KVA, rated voltage, and X/R ratio.

B. Short-Circuit Output Data shall include, but not be limited to the following reports:
1. Low Voltage Fault Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
   a. Voltage
   b. Calculated fault current magnitude and angle
   c. Fault point X/R ratio
   d. Equivalent impedance
2. Momentary Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
   a. Voltage
   b. Calculated symmetrical fault current magnitude and angle
   c. Fault point X/R ratio
   d. Calculated asymmetrical fault currents
3. Based on fault point X/R ratio
4. Based on calculated symmetrical value multiplied by 1.6
5. Based on calculated symmetrical value multiplied by 2.7
   a. Equivalent impedance
6. Interrupting Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
   a. Voltage
   b. Calculated symmetrical fault current magnitude and angle
   c. Fault point X/R ratio
   d. No AC Decrement (NACD) Ratio
   e. Equivalent impedance
   f. Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a symmetrical basis
   g. Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a total basis

C. Recommended Protective Device Settings:
1. Phase and Ground Relays:
   a. Current transformer ratio
   b. Current setting
   c. Time setting
   d. Instantaneous setting
   e. Recommendations on improved relaying systems, if applicable.
2. Circuit Breakers:
   a. Adjustable pickups and time delays (long time, short time, ground)

b. Adjustable time-current characteristic
c. Adjustable instantaneous pickup
d. Recommendations on improved trip systems, if applicable.

PART 3 EXECUTION

3.01 FIELD ADJUSTMENT

A. Adjust relay and protective device settings according to the recommended settings table provided by the coordination study. Field adjustments to be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to provide for conformance with short circuit and protective device coordination studies.

C. Notify Owner in writing of any required major equipment modifications.

3.02 ARC FLASH WARNING LABELS

A. The label shall include the following information, at a minimum:
1. Location designation
2. Nominal voltage
3. Hazard risk category
4. Incident energy
5. Working distance
6. Engineering report number, revision number and issue date.

B. Labels shall be machine printed, with no field markings.

C. Labels shall be field installed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

END OF SECTION

SECTION 26 22 13

LOW VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide dry type transformers as shown on drawings.

1.02 RELATED SECTIONS

A. Section 26 05 26: Grounding and Bonding for Electrical Systems

B. Section 26 05 53: Identification for Electrical Systems.

1.03 REFERENCES

A. ANSI/IEEE C57.96 - Distribution and Power Transformers, Guide for Loading Dry-Type (appendix to ANSI C57.12 standards)

B. ANSI/IEEE C89.2 - Dry Type Transformers for General Applications

C. ANSI/NFPA 70 - National Electrical Code

D. IEEE C57.12.01 - General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid Cast and / or Resin-Encapsulated Windings

E. IEEE C57.12.91 - Test Code for Dry-Type Distribution and Power Transformers

F. NEMA ST 20 - Dry Type Transformers for General Applications

G. UL 506 - Specialty Transformers

1.04 SUBMITTALS

A. Submit products for review.

B. Submit dimensioned equipment location layouts in accordance with section 26 05 00.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D

B. Eaton/Cutler-Hammer

C. General Electric

D. Siemens

2.02 EQUIPMENT REQUIREMENTS

A. Provide general purpose, self cooled dry type transformers designed for 60 Hz operation as shown on drawings. Transformers to be designed, manufactured and tested in accordance with the latest ANSI, NEMA and IEEE Standards. Transformers to be listed and labeled in accordance with UL 1561.

B. Transformers to be compliant with NEMA TP-1 energy efficiency requirements per EPAct 2005/CFR 10 Part 431.

2.03 INSULATION SYSTEM

A. Provide ventilated type transformers for 15 KVA and larger with a UL recognized 220 degree insulation system. Base the KVA ratings on an allowable 80, 115 or 150 degree C winding temperature rise above a 30 degree hot spot.

B. Transformer design KVA Rating shall be suitable for a 30 degree C average and 40 degree C maximum ambient temperature.

2.04 CORE AND COIL

A. Core construction to be of non-aging electrical grade grain-oriented silicon steel to minimize hysteresis and eddy current losses. Core lamination shall be tightly assembled.

B. Provide windings wound of high quality copper or aluminum.

C. Arrange ventilated windings to brace coil layers and provide maximum ventilation. Construct core and coil assemblies to provide short circuit withstand capability as defined by ANSI and NEMA standards. Securely bolt complete assembly to the enclosure base using vibration dampening pads to reduce noise.

D. The complete core and coil shall be impregnated with non-hydroscopic, thermo-setting polyester varnish to provide a high dielectric and flame retardant seal. The shield of varnish to the coils shall effectively impregnate the entire core and coil assembly that results in a unit which is virtually impermeable to moisture, dust, salt air and other contaminants. Cast encapsulated core and windings in a resin compound to provide a moisture-proof, shock-resistant, high dielectric seal.

E. Provide full capacity taps in the high-voltage windings of transformers. For 3 phase transformers rated below 15 KVA, provide two 5% full capacity below normal taps . For 3 phase transformers rated 15 KVA and above, provide two 2.5% full capacity above normal taps and four 2.5% full capacity below normal taps

2.05 ENCLOSURES

A. Provide NEMA 1 ventilated enclosures of heavy gauge steel construction for indoor transformers. Provide weather shields for ventilated transformers installed outdoors

conforming to the requirements of NEMA 250, Type 3R. Finish enclosures in ANSI 61 gray paint.

B. Unless otherwise specified, sound levels shall be in accordance with values allowed by NEMA ST-20.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Provide flexible conduit to and from transformer.

B. Install transformers in accordance with manufacturer's recommendations.

C. Provide vibration isolation devices whether floor mounted or hung from structure as follows:
   1. Install floor mounted transformers on two (2) layer, one (1) inch thick, rubber neoprene pads with galvanized shims (Mason Super "W" or equal).
   2. For suspended transformers provide spring hangers (Mason 30N or equal) with double neoprene elements at the top of the device with spring seated neoprene cups at the base of the device for sway bracing purposes.

D. Provide working clearances around transformers in accordance with Article 110 of the National Electrical Code.

E. Provide separation and clearance around transformers in accordance with manufacturer's recommendation to allow adequate cooling.

F. Ground transformers in accordance with Articles 250 and 450 of the National Electrical Code.

G. Mount floor mounted transformers on one inch (1") thick rubber pad.

END OF SECTION

SECTION 26 24 13

SWITCHBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and install a complete system of Low Voltage, Type 1 and/or Type 2 switchboards with circuit breakers and/or fusible switches for mains, ties. and feeders as specified below and as indicated on the drawings.

B. The requirements of the Contract, Division 01 and Division 26, apply to work in this section.

1.02 RELATED SECTIONS

A. Section 26 05 00: Common Work Results for Electrical

B. Section 26 43 13: Transient Voltage Surge Suppression

1.03 REFERENCES

A. The low voltage switchboards and protection devices in this specification are designed and manufactured according to latest revision of the following applicable standards.
   1. ANSI C37.16, Low Voltage Power Circuit Breakers and AC Power Circuit Protectors, Preferred Ratings, Related Requirements and Application Recommendations for
   2. ANSI/IEEE C37.13. Low-voltage AC power circuit breakers used in enclosures.
   3. ANSI/NEMA PB 2, Deadfront Distribution Switchboards
   4. ANSI/NEMA PB 2.1, General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less
   5. ANSI/NFPA 70, National Electrical Code
   6. NEMA AB 1, Molded Case Circuit Breakers and Molded Case Switches
   7. NEMA KS 1, Fused and Non - Fused Switches
   8. UL 489, Molded Case Circuit Breakers and Circuit Breaker Enclosures
   9. UL 891, Dead Front Switchboards
   10. UL 98, Enclosed and Dead Front Switches
   11. UL 1066, Low Voltage AC and DC Circuit Breakers Used in Enclosures
   12. UL 977, Fused Power Circuit Devices

1.04 DEFINITIONS

A. Insulated Case Circuit Breaker: Molded case circuit breaker built and listed to UL489 requirements. Insulated case circuit breakers are distinguished from normal molded case circuit breakers by the stored energy mechanism employed to open and close and the inclusion of internal motor operators when electrical operation is required.

B. Low Voltage Power Circuit Breaker: Also typically referred to as "air circuit breaker", "metal frame circuit breaker," or "ANSI circuit breaker". Differentiated from molded case and insulated case circuit breakers by many characteristics defined in the applicable UL and ANSI standards, including but not exclusively, significant 30 cycle withstand ratings, single pole ratings, and ease of maintenance.

C. Bolted Pressure Switch: Also referred to as high pressure contact switches. A type of switch with a spring loaded mechanism to close or open the circuit and a method of applying high pressure to the contacts to ensure high ampacity similar to a bolted bus joint.

D. Front-Accessible Only: Shall be as defined by UL 891 standard which requires that all line and load connections for phase, neutral, and ground conductors be accessible front the front of the switchboard allowing it to be mounted against a wall.

1.05 SYSTEM DESCRIPTION

A. The power system feeding the switchboard shall be 277/480 volt, solidly grounded wye unless noted otherwise on the drawings.

B. Switchboard(s) shall have front access and rear alignment for mounting against a wall or rear access as indicated on the drawings.

1.06 SUBMITTALS

A. Manufacturer shall provide minimum of 8 copies of the following documents, where applicable, to owner for review and evaluation in accordance with general requirements of Division 01 and Division 26:
   1. Front view and floor plan of switchboard
   2. Switchboard anchoring locations
   3. Conduit and busway entry / exit locations
   4. One-line diagram of switchboard bus and protective devices
   5. Switchboard ratings including:
      a. Short circuit rating
      b. System voltage rating
      c. Continuous current rating
   6. Protective device schedule including:
      a. Device type
      b. Sensor and trip rating
      c. Location within the switchboard
      d. Cable quantity and size capabilities for each device
   7. Panel drawing showing all major protection, instrumentation, and control devices mounted within the switchboard
   8. Schematic diagram showing power, metering, and control circuits for the switchboard and circuit breakers
   9. Bill of Material listing (including quantity, location, catalog number, and ratings) of all major protection, instrumentation and control devices
   10. Switchboard nameplate schedule

1.07 PROJECT RECORD DOCUMENTS

A. Manufacturer shall submit minimum 8 copies:
   1. Include as built record drawings as follows:
      a. Front View
      b. Floor Plan
      c. Elementary Diagram showing power, metering and control circuits
      d. Switchgear internal wiring diagrams
      e. Bill of Material
      f. One Line Diagram
      g. Three Line Diagram
   2. Instruction books on major components
   3. Installation drawings
   4. Certified test reports
   5. Recommended renewal parts information

1.08 INSTALLATION, OPERATION AND MAINTENANCE DATA

A. Manufacturer shall provide minimum 8 copies of installation, operation, and maintenance procedures to owner in accordance with general requirements of Division 01 and Division 26.

B. Submit operation and maintenance data based on factory and field testing, operation and maintenance of specified product.

1.09 QUALITY ASSURANCE QUALIFICATIONS

A. Manufacturer shall have specialized in the manufacture and assembly of low voltage switchboards for 25 years.

B. Manufacturer shall have available for review, if requested by the engineer, a certificate of ISO 9002 Compliance.

1.10 REGULATORY REQUIREMENTS

A. Low voltage switchboards shall be listed and/or classified by Underwriters Laboratories in accordance with standards listed in paragraph 1.03 of this specification and shall bear UL labels in accordance with those standards.

B. Switchboards shall be qualified for use in seismic loading UBC zone that is appropriate for the site location as defined in IEEE 693.

C. Where used as service entrance equipment, it shall be listed as a service entrance switchboard.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall store, protect, and handle products in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals.

B. Ship each switchboard section in individual shipping splits for ease of handling. Each section shall be mounted on shipping skids and wrapped for protection.

C. Contractor shall inspect and report concealed damage to carrier within 48 hours.

D. Contractor shall store in a clean, dry space. Cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Provide heat in the enclosures to prevent condensation.

E. Contractor shall handle in accordance with manufacturer's recommendations to avoid damaging equipment, installed devices, and finish.

1.12 PROJECT CONDITIONS (SITE ENVIRONMENTAL CONDITIONS)

A. Follow applicable NEMA, ANSI, and NECA standard practices before, during, and after switchboard installation.

B. Indoor switchboards shall be located in well-ventilated areas, free from excess humidity, dust, and dirt and away from hazardous materials. Ambient temperature of area will be between 0 and plus 40 degrees C.

C. Outdoor switchboards shall be located in well-ventilated areas, and away from hazardous materials. Ambient temperature of area will be between minus 30 and plus 40 degrees C.

1.13 SEQUENCING AND SCHEDULING

A. Provide a written detailed description of scheduled installation, testing, and startup dates.

1.14 WARRANTY

A. Manufacturer warrants equipment to be free from defects in materials and workmanship for 1 year from date of acceptance by the owner or 18 months from date of delivery, whichever occurs first.

1.15 FIELD MEASUREMENTS

A. Contractor shall make all necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in National Electrical Code.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approved manufacturers are:
   1. General Electric
   2. Eaton/Cutler Hammer
   3. Siemens Energy Automation
   4. Square D

B. Other manufacturers' products of equivalent quality, dimensions and operating features may be acceptable, at the Engineer's discretion, if they comply with all requirements specified or indicated in these Contract documents. Request for approval shall be submitted 10 business days before bid date. Substitutions will not be considered after this date.

2.02 EQUIPMENT

A. Furnish Low Voltage Switchboards with molded case, insulated case, steel frame power circuit breakers, fusible switches, and/or bolted pressure switches as indicated on drawings and in this specification.

B. Provide unit substation transformers where indicated on the drawings and as specified in transformer specifications.

2.03 COMPONENTS

A. Refer to Contract Drawings for actual layout and location of equipment and components; current ratings of devices, bus bars, and components; voltage ratings of devices, components and assemblies; interrupting and withstand ratings of devices, buses, and components; and other required details.

B. General
   1. The low voltage switchboards shall be rated 480/277 volts, 3 phase, 4-wire with 100 percent neutral, 60 hz unless indicated otherwise on the drawings.
   2. Switchboards shall include all protective devices and equipment listed on drawings with necessary interconnections, instrumentation, and control wiring.

C. Enclosure
   1. Indoor switchgear shall be furnished with an NEMA 1 enclosure and outdoor switchgear with a NEMA 3R non walk-in enclosure unless indicated otherwise on the drawings.

D. Structure (Type 1 & 2)
   1. Switchboards shall be fully self-supporting structures with 90 inch tall vertical sections (excluding lifting eyes and pull boxes) bolted together to form required arrangement.
   2. Switchboard frame shall be die formed, 12 gauge steel with reinforced corner gussets. Frame shall be rigidly bolted to support cover plates (code gauge steel), bus bars, and installed devices during shipment and installation.
   3. All sections may be rolled, moved, or lifted into position. Switchboards shall be capable of being bolted directly to the floor without the use of floor sills.
   4. All switchboard sections shall have open bottoms and removable top plate(s) to install conduit.
   5. Type 1 front-access only switchboards shall be rear aligned for placement against a wall or free standing. Type 2 front/rear-access switchboards shall be front and rear aligned for free standing.
   6. Switchboards shall be UL listed.
   7. All covers shall be fastened by hex head bolts.

8. Provide hinged doors over metering compartments and individually mounted device compartments. All doors shall have concealed hinges and be fastened by hex head bolts.
9. Switchboard protective devices shall be furnished as listed on drawings and specified herein, including interconnections, instrumentation, and control wiring. Switchboards and devices shall be rated for the voltage and frequency listed on the drawings.
10. Switchboard current ratings, including all devices, shall be based on a maximum ambient temperature of 25 degree C per UL Standard 891. With no de-rating required, temperature rise of switchboards and devices shall not exceed 65 degrees C in a 25 degree C ambient environment.

E. Bus Bars
1. Bus bars shall be tin-plated copper. The bus bars shall have sufficient cross sectional area to meet UL 891 temperature rise requirements through actual tests. Phase and neutral bus ampacity shall be as indicated on the drawings. The neutral bus shall have the same ampacity as the phase bus.
2. Bus bars shall be mounted on high impact, non-tracking insulated supports. Joints in the vertical bus are not permitted.
3. Bus bars shall be braced to withstand mechanical forces exerted during short circuit conditions as indicated in drawings, but in no case less than 65 kA RMS SYM.
4. A-B-C bus arrangement (left to right, top to bottom, and front to rear) shall be used throughout to assure convenient and safe testing and maintenance. Where special circuitry precludes this arrangement, bus bars shall be labeled.
5. All feeder device line and load connection straps shall be rated to carry current rating of device frame (not trip rating).
6. The main incoming bus bars shall be rated for the main protective device frame size or main incoming conductors, if there is no main device.
7. Main horizontal bus bars shall be fully rated and arranged for future extensions.
8. All draw-out breaker primary connections shall be silver-plated. Breaker primary connections for stationary-mounted breakers shall have the same plating as the main bus.
9. The main bus and riser bus shall be fully isolated from the circuit breaker, instrument, and auxiliary compartments. The vertical bus shall be mounted on supports of high impact, non-tracking, flame-retardant, molded glass-reinforced polyester. Vertical bus in molded case breaker sections shall be extended to all compartments in the section including blank compartments that may be at the top and / or bottom of the section.
10. A copper ground bus, 1.0 sq inches minimum, shall be secured to the rear frame of each vertical section and shall extend through the entire length of the switchboard. The ground bus shall be provided with a 4/0 terminal for connection to the electrical system ground. A lug strap shall be provided for each vertical section for feeder ground cable terminations.
11. All bus hardware shall be high tensile strength, grade 5, zinc-plated steel. All bolted bus joints shall be provided with split-type lock washers.

F. Service Entrance
1. Switchboard Service Entrance sections shall comply with UL Service Entrance requirements including a UL service entrance label, incoming line isolation

barriers, and a removable neutral bond to switchboard ground for solidly grounded wye systems.

G. Incoming Line Section
   1. Incoming line section shall be the ampacity, wiring system, and type of connection as shown on the drawings.
   2. Incoming line shall be directly connected to the transformer on unit substations.

H. Breaker Compartment
   1. Type 1 Switchboards
      a. Switchboards rated 1200 amperes or less shall have group mounted main and group mounted feeder devices.
      b. Circuit breakers 1200 ampere and below shall be molded case circuit breakers.
      c. Switches 1200 ampere and below shall be fusible switches.
   2. Class 2 Switchboards.
      a. Switchboards rated 1200 amperes or less shall have individually mounted main device and group mounted feeder devices.
      b. Circuit breakers 1200 ampere and below shall be molded case circuit breakers.
      c. Switches 1200 ampere and below shall be fusible switches.

2.04 CIRCUIT BREAKERS & FUSIBLE SWITCHES

A. Molded Case Circuit Breakers
   1. Group mounted breakers shall be connected to the vertical bus by bolted connections.
   2. Individually mounted molded case circuit breakers shall be stationary mounted.
   3. Circuit breaker frames shall be constructed of a high-strength, molded, glass-reinforced polyester case and cover. Breakers shall have an overcenter, toggle handle-operated, trip free mechanism with quick make, quick break action independent of the speed of the toggle handle operation. The design shall provide common tripping of all poles. Breakers shall be suitable for reverse feeding.
   4. Breakers shall have ON and OFF position clearly marked on escutcheon. Breakers shall include a trip-to-test means on the escutcheon for manually tripping the breaker and exercising the mechanism and trip latch.
   5. Breakers shall include factory installed mechanical lugs. Lugs shall be UL listed and rated 75 degrees C.
   6. Breakers 150 amperes and smaller shall have a electronic trip unit with true digital RMS sensing trip units and an interchangeable rating plug to determine the breaker trip rating. They shall have an adjustable instantaneous with short time tracking function.
   7. Breakers 225 amperes and larger shall have digital electronic trip units as described in paragraph 2.05.
   8. Breakers shall be UL listed as 100 percent continuous duty rated unless noted otherwise on the drawings.

B. Insulated Case Circuit Breakers
   1. Insulated case circuit breakers shall be individually mounted.
   2. Main and tie breakers shall be manually or electrically operated, stationary or draw-out as indicated on drawings. Feeder breakers larger than 1200 amps shall

be manually or electrically operated stationary or draw-out as indicated on drawings.

3. Breakers shall be constructed of a high dielectric strength, glass reinforced insulating case. The interrupting mechanism shall be arc chutes. Steel vent grids shall be used to suppress arcs and cool vented gases. Interphase barriers shall to isolate completely each pole.
4. Breakers shall contain a true two-step stored energy operating mechanism which shall provide quick make, quick break operation with a maximum five-cycle closing time. Breakers shall be trip free at all times. Common tripping of all poles shall be standard.
5. Insulated Case circuit breakers shall be rated to carry 100 percent of their frame ampacity continuously.
6. A charging handle, close push-button, open push-button, and Off/On/Charge indicator shall be located on the breaker escutcheon and shall be visible with the breaker compartment door closed.
7. Where draw-out breakers are specified, the draw-out design shall permit the breaker to be withdrawn from an engaged position, to a test position, and to a disengaged position.
8. Breaker digital electronic trip units shall be as described in paragraph 2.05.

C. Low Voltage Power Circuit Breakers

1. Circuit breakers shall be individually mounted, draw-out, low voltage devices, metal frame construction, manually or electrically operated as indicated on drawings with features and accessories as described in this specification.
2. Interrupting mechanism shall contain arc chutes to suppress arcs and cool vented gases. Breaker cubicles shall not require "flash shields".
3. Inter-phase barriers of insulating material shall isolate each breaker pole.
4. The breaker front shall have standard padlocking provisions to lock the breaker open and mechanically trip-free. The padlock provision shall accept up to three padlocks with one-quarter to three-eighth inch diameter shanks.
5. Each draw-out breaker shall have provisions for up to 72 dedicated secondary disconnects.
6. All breaker control circuits and trip unit inputs / outputs shall be wired through the secondary disconnects.
7. Secondary disconnects shall be self-aligning. They shall automatically couple with mating points in the breaker cubicle with the breaker in the "test' or 'connect' position.
8. Circuit breakers shall have a rejection system that will only allow breakers of the correct ampere rating to be installed in the cubicle. A breaker with a higher short circuit rating may be mounted in the cubicle, if it has the same frame rating. Integrally fused breakers shall not be allowed to be mounted in cubicles for non-fused breakers.
9. Breakers shall have a rugged guide bar that ensures alignment of primary and secondary disconnects as the breaker is racked into the 'test' or 'connect' position.
10. Draw-out breakers shall have wheels to allow rolling the breaker into the cubicle, once it is installed on the draw-out rails.
11. Complete breaker operating status shall be available at the front of the breaker. Indicators in the breaker escutcheon shall provide closing spring status (charge / discharge), breaker main contact status (open / closed) and breaker draw-out position (connect / test / disconnect).

12. Circuit breakers shall be rated to carry 100 percent of the breaker current rating continuously. Provide breakers with current ratings as indicated on drawings.
13. Minimum interrupting ratings shall be as shown on the drawings.
14. Circuit breakers shall have true 30-cycle withstand capability equal to the breaker short time interrupting rating.
15. The circuit breaker shall not have a hidden instantaneous or a making current release to achieve short time withstand ratings.
16. Control voltage for electrically operated breakers 120 volts AC unless indicated otherwise on drawings.
17. Provide a true two-step, stored energy mechanism which shall provide quick-make and quick-break operation, including charge-after-close operation.
18. Closing springs shall be able to be discharged without closing main contacts.
19. Maximum closing time shall be 5 cycles at nominal control voltage.
20. Each breaker shall have a flush-mounted, retractable charging handle and close / open pushbuttons. The handle shall be able to completely charge an electrically operated breaker, if control power is lost during the charging operation.
21. All manual charge / close / open control operators shall be accessible from the breaker cubicle front with the breaker installed and the cubicle door closed.
22. Mechanical interlocks shall prevent moving the breaker from the 'connect', 'test', or 'disconnect' position unless the main breaker contacts are open.
23. The breaker shall be prevented from closing during any racking operation and shall remain trip free except in the 'test' or 'connect' position.
24. A mechanical interlock shall discharge the energy in the closing springs before the breaker is withdrawn from the cubicle.
25. The 'test' position shall permit operating the breaker while disconnected from power circuits.
26. Breaker digital electronic trip units shall be as described in paragraph 2.05.

D. Individually Mounted Fusible Switches
1. Bolted Pressure Switches shall be butt type contact construction with multiple, spring-loaded main arms and an arcing arm per pole. An over-center toggle mechanism shall provide quick make, quick break operation.
2. Switches shall have a molded insulating case and cover with integrally molded interphase partitions. All current carrying parts shall be silver plated copper.
3. Fusible switches shall be equipped with mounting provisions for UL class L fuses. Switches shall have an interrupting rating of 200 KAIC RMS SYM at 600V when used with class L fuses. Provide a complete set of UL class L fuses for each switch. (K rated when feeding a motor)
4. Switches shall be rated for making and breaking 12 times nameplate rated current at 600 VAC. Switches shall be rated to carry 100 percent of their frame ampacity continuously.
5. Switches shall be manually operated and stationary mounted. Switches shall have a front mounted operating handle for charging the closing springs and closing the switch and a push-button for opening the switch. Switches shall include a visible external ON - OFF indicator.
6. Switches shall have defeatable, front access, coin proof interlocks. Interlocks shall prevent opening switch door when switch is ON and prevent turning switch ON when door is open. Switches shall include provisions for padlocking the switch in the open position.

2.05 CIRCUIT BREAKER TRIP UNITS

A. Provide power management digital electronic trip unit for main and tie circuit breakers and feeder protection digital electronic trip unit for feeder circuit breakers as indicated on drawings and as specified below.

B. The trip unit shall provide protection from overload, short circuit, ground fault, and other optional functions as indicated on the drawings or specified. The protective trip unit shall consist of a solid state, microprocessor based programmer; tripping means; current sensors; power supply and other devices as required for proper operation.

C. As a minimum, the trip unit shall have the following protective functions:
   1. Adjustable current setting or long time pickup
   2. Adjustable long time delay
   3. Adjustable instantaneous pickup (Shall have OFF-ON function so it can be turned off for normal operation and on for maintenance to reduce ARC FLASH hazards)
   4. Adjustable ground fault pickup and delay with a switchable I2t ramp
      a. When used on emergency systems, provide ground fault alarm
      b. Do not provide ground fault on 120/208 volt systems
      c. Adjustable short time pickup and delay with a switchable I2t ramp

D. As a minimum, the trip unit shall include the following features:
   1. Long time and short time protective functions, shall have true RMS sensing technology
   2. Ground fault protective function, if provided, shall contain a memory circuit to integrate low level arcing fault currents with time, to sum the intermittent ground fault spikes
   3. High contrast liquid crystal display (LCD) unit shall display settings, trip targets, and the specified metering displays
   4. Multi-button keypad to provide local setup and readout of all trip settings on the LCD
   5. UL Listed interchangeable rating plug. It shall not be necessary to remove the trip unit to change the rating plug
   6. An integral test jack for testing via a portable test set and connection to a battery source
   7. A mechanism for sealing the rating plug and the trip unit
   8. Noise immunity shall meet the requirements of IEEE C37.90
   9. Display trip targets for long time, short time, and ground fault, if included

E. The feeder protection trip unit shall include the following metering functions, which shall be displayed on the LCD (if the manufacturers trip unit cannot incorporate the specified functions, separate device(s) with equal functions shall be provided for each breaker):
   1. Current, RMS, each phase

F. The main and tie breaker power management trip unit shall include the following metering functions, which shall be displayed on the LCD (if the manufacturers trip unit cannot incorporate the specified functions, separate device(s) with equal functions shall be provided for each breaker):
   1. Current, RMS, each phase
   2. Voltage, RMS, line - to - line, or line - to - neutral

3. Energy, KWH, total
4. Demand KWH, over an adjustable time period of 5 to 60 minutes
5. Peak demand, KW, user resettable
6. Real power, KW, line - to - line, line - to - neutral
7. Total (apparent) power, KVA, line to - line, line - to - neutral

2.06 WIRING

A. All control wire shall be type SIS. Control wiring shall be #14 AWG for control circuits, #12 AWG for close, trip, and potential transformer circuits, and #10 AWG for current transformer circuits. Ring type terminals shall be used on all CT, PT, close, and trip circuits. Wire bundles shall be secured with nylon ties and anchored to the assembly with the use of pre-punched wire lances or nylon non-adhesive anchors. All current transformer secondary leads shall first be connected to conveniently accessible shorting terminal blocks before connecting to any other device. Shorting screws with provisions for storage shall be provided. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips and provisions for #10 AWG field connections. Each control wire shall be marked to the origin zone/wire name/destination zone over the entire length of the wire using a UV cured ink process. Provide wire markers at each end of all control wiring. Plug-in terminal blocks shall be provided for all shipping split wires. Terminal connections to remote devices or sources shall be front accessible via doors above each circuit breaker.

B. Furnish fuse holders in switchgear when required.

C. Terminal blocks for external connections shall be heavy duty, molded, one-piece type, rated 600 volts, 50 amperes.

D. Terminal blocks shall be mounted in the rear cable compartment, easily accessible, away from the runbacks and cable terminals.

E. Furnish a bolted steel cover to enclose the terminal blocks.

F. NEMA 2-hole, long barrel crimp- type lugs shall be provided for all line and load terminations suitable for copper cable rated for 90 degrees C of the size indicated on the drawings.

G. Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.

H. Insulated, locking spade terminals shall be used on all #14 AWG terminations.

I. Insulated, ring terminals shall be used on all #12 and # 10 AWG terminations.

2.07 ACCESSORIES

A. Fuses
1. Manufacturer: Gould - Shawmut (or equal).
2. Interrupting Rating of all fuses shall be 200,000 RMS amperes.

B. Individually Mounted Fusible Switch Accessories
   1. Provide the following UL listed accessories where indicated on the drawings:
      a. 120 VAC Electric trip and control power transformer
      b. Blown - fuse Protector
      c. Provision for Key Interlock
      d. Auxiliary Switches with one single-pole, double-throw elements
      e. Integral, self-powered ground fault protection relay with mechanical ground fault indicator, test function, adjustable current pick - up and time delay, and current sensors as required. Ground fault relay shall have an internal memory circuit that integrates intermittent arcing ground faults with time.

C. Furnish nameplates for each device as indicated in drawings. Color schemes shall be as indicated on drawings.

D. Provide Transient Voltage Surge Suppression system where indicated on drawings and as specified in Section 26 43 13.

2.08 FACTORY TESTING

A. Perform all tests recommended by NEMA, IEEE and ANSI standards

B. Perform complete operational checkout of all functions.

2.09 FINISH

A. All steel surfaces shall be chemically cleaned prior to painting.

B. Exterior paint color shall be ANSI 61 Light Gray over phosphate - type rust inhibitor.

PART 3 EXECUTION

3.01 EXAMINATION

A. The following procedures shall be performed by the Contractor:
   1. Examine installation area to ensure there is enough clearance to install switchboard.
   2. Check concrete pads for uniformity and level surface.
   3. Verify that switchboards are ready to install.
   4. Verify field measurements are as shown on Drawings.
   5. Verify that required utilities are available, in proper location and ready for use.
   6. Beginning of installation means installer accepts conditions.

3.02 INSTALLATION

A. Contractor shall furnish and completely install all switchgear as shown on drawings and per manufacturer's instruction books

B. Install required safety labels including arc flash requirements.

C. All necessary hardware to secure the assembly in place shall be provided by the Contractor.

D. The equipment shall be installed and checked in accordance with the manufacturer's recommendations. This shall include but is not limited to the following:
   1. Checking to ensure that all relays and/or protective devices are set properly
   2. Checking to ensure that the pad location is level to within 0.125 inches per three foot of distance in any direction
   3. Checking to ensure that all bus bars are torqued to the manufacturer's recommendations
   4. Assembling all shipping sections, removing all shipping braces, and connecting all shipping split mechanical and electrical connections
   5. Securing assemblies to foundation or floor channels
   6. Measuring and recording Megger readings phase-to-phase, phase-to-ground, and neutral-to-ground (four wire systems only).
   7. Measuring and recording the impedance of the equipment to the building grounding electrode.
   8. Inspecting and installing all circuit breakers in their proper compartments.

3.03 FIELD QUALITY CONTROL

A. Inspect installed switchboards for anchoring, alignment, grounding, and physical damage.

B. Check tightness of all accessible electrical connections with a calibrated torque wrench. Minimum acceptable values are as specified in manufacturer's instruction manual.

C. Check any key interlock system for proper functioning.

3.04 ADJUSTING

A. Refer to manufacturer's instruction book to make adjustments to circuit breakers, doors, handles, etc., as required.

B. Set trip units as per engineer's recommendations.

3.05 FIELD TESTING

A. Perform all tests required and/or recommended by the commissioning specification, NETA, ANSI standards, and the manufacturer.

B. Perform complete operational checkout of all functions.

C. Perform primary injection current testing of all circuit breakers 400 amperes and larger to ensure proper settings and tripping functions.

3.06 CLEANING

A. Clean interiors of switchgear to remove construction debris, dirt, and shipping materials.

B. Repaint scratched or marred exterior surfaces to match original finish.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide circuit breaker type panelboards as indicated on drawings and as specified hereinafter.

1.02 RELATED SECTIONS

A. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables

B. Section 26 05 26: Grounding and Bonding for Electrical Systems

C. Section 26 05 53: Identification for Electrical Systems

D. Section 26 05 73: Power System Studies

1.03 REFERENCES

A. UL 67 Panelboards

B. UL 50 Cabinets and Boxes

C. NEMA PB 1

D. Federal Spec W-P-115C

1.04 SUBMITTALS

A. Submit the following product data for review:
   1. Shop drawings showing circuit breaker or fusible switch layout, dimensions, voltage, phasing, continuous current capacity, short circuit rating, series rating (if applicable)
   2. Conduit entry location, cable termination sizes, mounting

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D

B. General Electric

C. Eaton/Cutler-Hammer

D. Siemens Energy and Automation

2.02 PANELBOARD TYPES

A. Circuit breaker type lighting and appliance panelboards for 120/208 volts, 3-phase, 4-wire service shall be equipped with circuit breakers having AIC ratings as indicated on the drawings, but not less than 10,000 AIC. Panelboards shall be equal to:
   1. Square D, "N" series
   2. General Electric, type AQ
   3. Eaton/Cutler-Hammer, type PRL1A
   4. Siemens, type P1

B. Circuit breaker type lighting and appliance panelboards for 277/480 volts, 3-phase, 4-wire service shall be equipped with circuit breakers having AIC ratings as indicated on the drawings, but not less than 14,000 AIC. Panelboards shall be equal to:
   1. Square D, "N" series
   2. General Electric, Type AE
   3. Eaton/Cutler-Hammer, type PRL2A
   4. Siemens, type P2

C. Circuit breaker type power distribution panelboards for 120/208 volts, 3-phase, 4-wire service shall be equipped with circuit breakers having AIC rating as indicated on the drawings. Where AIC ratings are not shown on drawings obtain the rating requirements from the Architect. Panelboards shall be equal to:
   1. Square D, "I-Line" series distribution type
   2. General Electric, "Spectra" series distribution type
   3. Eaton/Cutler-Hammer, "PRL4B" distribution type
   4. Siemens, type P4 or P5, depending upon panelboard ampacity

D. Circuit breaker type power distribution panelboards for 277/480 volts, 3-phase, 4-wire service shall be equipped with circuit breakers having AIC rating as indicated on the drawings. Where AIC ratings are not shown on drawings, obtain the rating requirements from the Architect. Panelboards shall be equal to:
   1. Square D, "I-Line" series distribution type
   2. General Electric, "Spectra" series distribution type
   3. Eaton/Cutler-Hammer, "PRL4B" distribution type
   4. Siemens, type P4 or P5 depending upon panelboard ampacity

E. Where a power study is required by other sections and the results indicate that higher AIC ratings are required than shown on drawings, furnish panelboards and circuit breakers with AIC ratings in accordance with the power study.

F. Fusible switch type power distribution panelboards shall be Square D type QMB, Eaton PRL4F, GE Spectra Series and Siemen type P4/P5.

G. Provide fuses for fusible switch type distribution panelboards as specified in 26 05 00 and as shown on drawings. Provide R-clips in switches where Class R fuses are used.

H. Bus bars shall be copper.

I. Power distribution panelboards shall be a minimum 36" in width.

J. Power distribution panelboards shall be furnished with full-height bussing.

2.03 REQUIRED FEATURES

A. Provide circuit breakers with lugs (both main and branch circuit lugs) suitable and UL listed for both aluminum and copper conductors and rated for minimum 75 degrees C.

B. Provide electrically isolated factory installed neutral bus.

C. Provide a second, fully rated electrically isolated factory installed, neutral bus where called for on the drawings.

D. Provide separate ground bars complete with lugs or connectors on bar. Provide an additional copper isolated/insulated ground bar where indicated on drawings.

E. Panelboard assembly shall be enclosed in a steel cabinet. The size of the wiring gutters shall be in accordance with U.L. Standard 67. Fronts shall have door with matching trim, be of code gauge full finished steel with rust inhibiting primer and baked enamel finish.

F. Cabinets shall be equipped with spring latch and tumbler lock on door of trim. Doors over 48" long shall be equipped with three point latch and vault lock. All locks shall be keyed alike.

G. Surface mounted panelboards shall be provided with hinged trims such that devices, lugs, and gutters may be exposed without completely removing trim. Flush mounted panelboards shall have "easy-to-remove" trims.

H. Provide thermal magnetic circuit breakers which are fully rated and temperature rated for a 40 degrees C ambient. Breakers shall be quick-make, quick-break type with trip indication shown by handle position other than ON or OFF and with a common trip on all multi-pole breakers.

I. Refer to drawings for numbers of branch circuits, their ratings, number of poles and arrangements.

J. Surfaces of the enclosure and trim shall be properly cleaned and painted gray, ANSI 61.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install per manufacturer's recommendations and contract documents.

B. Ground separate ground bars to panel boxes and to the main service entrance ground bus with a code-sized equipment grounding conductor installed in the same conduit as the phase and neutral conductors.

C. Install circuits using a common neutral in accordance with the National Electrical Code.

D. Provide six circuit breaker handle lock-on devices for each branch-circuit panelboard, installed as directed by Owner's Representative, to prevent unauthorized personnel from turning off circuits to controls, unit heaters, clocks, night lights. Turn spare lock-on devices over to the Owner's Representative.

E. Provide typed directory cards under plastic on the doors of branch circuit panelboards. Directories shall indicate devices being served including space numbers or space names in which devices or fixtures are located. Space names and numbers shall match the graphics installed if different from the space names and numbers on the drawings.

F. Provide shunt trip circuit breakers for kitchen equipment branch circuits under range hoods.

G. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacturer's recommendations.

H. Check all installed panels for proper grounding, fastening, and alignment.

I. Remove debris from panelboards and wipe dust and dirt from all components.

J. Repaint marred and scratched surfaces with touch-up paint to match original finish.

K. Where panelboards are installed flush mounted, provide a minimum of (6)-1" spare conduits stubbed out above ceiling for future use by owner.

L. Where multiple panels are flush mounted in public areas, provide enclosures and trims of matching dimensions.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide switches, receptacles, and other wiring devices as indicated on drawings.

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Arrow Hart

B. Eagle

C. Hubbell

D. Leviton

E. Pass and Seymour

F. Novitas, Inc

G. Hubbell numbers are used unless otherwise noted, but products of equivalent quality by named manufacturers will be acceptable.

2.02 DEVICE COLORS

A. Provide IVORY colored devices where available, unless otherwise noted.

B. Provide RED colored devices where available when connected to the emergency power system, unless otherwise noted.

2.03 SWITCHES

A. 15-Amp, 120/277 VAC, Heavy Duty Specification Grade:
   1. Single pole toggle: Hubbell No. HBL1201
   2. Three-way toggle: Hubbell No. HBL1203
   3. Single pole toggle, weatherproof: Hubbell No. HBL1201 with Hubbell No. HBL1795 weatherproof plate
   4. Single pole toggle with pilot light (120 VAC): Hubbell No. HBL1201IL

B. 20-Amp, 120/277 VAC, Heavy Duty, Specification Grade:
   1. Single pole toggle: Hubbell No. HBL1221
   2. Three-way toggle: Hubbell No. HBL1223
   3. Single pole toggle, weatherproof: Hubbell No. HBL1221 with Hubbell No. HBL1795 weatherproof plate
   4. Single pole toggle with pilot light (120 VAC): Hubbell No. HBL1221IL

C. Occupancy Sensor Switches, 120/277 VAC:
   1. Wall mounted, automatic on/manual on, passive infrared with ambient light sensing, minimum 1000 s.f. room coverage and 500 s.f. desktop activity coverage, 800 W @ 120V and 1200 W @ 277V: Leviton No. ODS10-ID
   2. Ceiling Mounted, 360 Degrees, 1,500 square feet coverage area - Leviton OSC15-10W

2.04 RECEPTACLES

A. 15-Amp, 125 VAC, Heavy Duty, Specification Grade:
   1. Duplex type: Hubbell No. HBL5252
   2. Ground fault circuit interrupter: Hubbell No. GF5262
   3. Duplex, tamper resistant: Hubbell No. HBL8200SG

B. 20-Amp, 125 VAC:
   1. Duplex type: Hubbell No. HBL5352
   2. Ground fault circuit interrupter: Hubbell No. GF5362
   3. Duplex, tamper resistant: Hubbell No. HBL8300SG

C. Weatherproof Type Cover:
   1. Damp location and outdoors protected from weather: Hubbell No. CWP26H
   2. Wet location and outdoors exposed to weather: Hubbell No. WP26MH

D. Miscellaneous Receptacles:
   1. Single 20-amp, 125/250 VAC, 3 pole, 4 wire, NEMA 14-20R: Hubbell No. HBL6810
   2. Single 20-amp, 125/250 VAC, 3 pole, 4 wire, 3 phase, NEMA 15-20R: Hubbell No. HBL8420
   3. Single 30-amp, 125/250 VAC, NEMA 14-30R: Hubbell No. HBL9430A
   4. Single 50-amp, 125/250 VAC, NEMA 14-50R: Hubbell No. HBL9450A

E. Floor Mounted:
   1. Standard Floor Box, 1 to 3 gang:
      a. Cast Iron (slab on grade applications): Walker No. 880CS-1 series
      b. Stamped Steel (elevated slab applications): Walker No. 880S series
      c. Combination Carpet & Tile Flange: Brass - Walker No. 817B (1 gang), Black - Walker No. 817PCC-BLK (1 gang) or Brown - Walker No. 817PCC-BRN (1 gang)
      d. Cover Plate with Flip Lids: Brass - Walker No. 828R (1gang), Black - Walker No. 828PR-BLK (1 gang) or Brown - Walker No. 828PR-BRN (1 gang)
   2. Floor Box, Multi-service, 4 compartment:
      a. Cast Iron (slab on grade applications): Walker No. RFB4-CI-1

b. Stamped Steel (elevated slab applications): Walker No. RFB4
c. Flanged Cover and Trim Ring: Walker No. S36CCTC with Aluminum, Black or Brass finish

3. Furniture Feed, fire-rated, poke-thru device for power and voice/data service:
   a. Service Fitting: Hubbell No. FRF3
   b. Through-Floor Fitting: Hubbell No. PT73SD
   c. Finish Color: Gray or Ivory
4. Pedestal type, 2 gang, fire-rated poke-through device for power and voice/data:
   a. Pedestal Housing and Faceplates: Hubbell No. FR280 / SS2309D / SS2309SL
   b. Through-Floor Fitting: Hubbell No. PT27A

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Mounting:
   1. Mount switches 46" above the finished floor to center line of switch unless noted otherwise.
   2. Mount receptacles 18" above the finished floor to center line of receptacle unless noted otherwise.
   3. Install receptacles shown on the drawings as "special mounting height" at mounting height indicated on drawings. Where no mounting height is given and receptacles are above counters, mount receptacles with centers 4" above top of counter. If the counter has a backsplash, receptacles shall be mounted with centers 4" above top of backsplash. Where special mounting height receptacles are not above counters and no mounting height is indicated, receptacle mounting heights shall match adjacent light switches or above counter receptacles. Coordinate the installation of all special mounting height receptacles with architectural design.
   4. Work devices to nearest block course using proper type outlet boxes as specified under Section 26 05 35. Check architectural and furniture drawings for counter (desk, special booth, etc.) locations. Mount devices above work counters. Verify other special mounting conditions and locate devices as required.

B. Polarity: Wire receptacles so that the hot wire, neutral wire and ground wire connect to the proper terminals.

C. Grounding: Install a No. 12 green ground wire from device grounding terminal back to grounding bus in panelboard, as noted on drawings.

D. Install floor boxes or poke-through fittings where shown on drawings with receptacle and/or communication outlet quantities as shown on drawings.
   1. Install one 3/4" conduit from power compartment to a junction box above accessible ceiling for each floor box. Box configuration to allow interconnection from end power compartment to opposite end power compartment.
   2. Install one dedicated 1" conduit from each communications compartment, stubbed out above accessible ceiling for each floor box.

E. Install receptacles with ground pin up.

F. For GFCI receptacles, do not utilize feed-thru feature, unless required by drawings.

G. A single receptacle installed on an individual branch circuit shall have an ampere rating of not less than that of the branch circuit.

END OF SECTION

SECTION 26 27 27

WIRING DEVICE PLATES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide device plates on switches, receptacles, telephone outlets and miscellaneous devices.

1.02 RELATED SECTIONS

A. Section 26 27 26: Wiring Devices

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide specification grade stainless steel device plates from the wiring device manufacturer.

B. Provide specification grade nylon device plates from the wiring device manufacturer. Provide device plates in colors to match the associated devices.

C. Provide cast alloy or stamped metal plates on exposed switches and receptacles.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install device plates in full contact with wall surface. Plates shall not project out from the wall.

B. Install device plates in full contact with surface mounted box. Plates shall not project out from the edge of the box.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide horsepower rated, quick-make, quick-break, safety switches with the number of poles and fuses as required. For 240 volt switches use general duty type. For 600 volt switches, use heavy duty type. Provide Class R fuse in clips in each type.

C. Switches shall have arc shields, be of enclosed construction and fusible or non-fusible as indicated. Switches shall be rated for either 240-volt AC or 600-volt AC service as required.

D. Switches shall be capable of interrupting locked rotor currents of motors which they serve.

E. Switches shall have UL listed lugs suitable for 75deg.C copper or aluminum conductors.

F. Switches shall be pad lockable in the open (off) position.

G. Fusible switches shall have a UL listed short circuit rating of 100,000 amps rms with fuses applied.

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D

B. General Electric

C. Eaton/Cutler-Hammer

D. Siemens Energy Automation

E. Provide Square D Series HU-660, six-pole safety switches for part-winding or two-speed motors requiring remote disconnects.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Provide non-fused switches at remote motor locations (rain-tight where required) as indicated on drawings and as required by NEC. Do not use if fault current exceeds 10,000 amperes.

B. Identify safety switches with Bakelite nameplates in accordance with Section 26 05 00.

C. Use NEMA 1 for interior use and NEMA-3R for exterior use.

D. Provide two normally open and two normally closed auxiliary contacts for disconnect switches used to serve fan system motors including supply fans, return air fans, exhaust fans, make up air fans, and relief air fans for electrical interlock with mechanical control circuits.

E. Switches used for service equipment shall be Heavy Duty type, UL listed for service equipment use.

END OF SECTION

SECTION 26 29 13

MOTOR STARTERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Motor starters

B. Provide wiring in accordance with Section 26 05 00.

1.02 RELATED SECTIONS

A. Division 23: HVAC

B. Section 26 05 19: Low Voltage Electrical Power Conductors

C. Section 26 05 33: Raceways and Conduit Systems

D. Section 26 05 53: Identification for Electrical Systems.

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 STARTERS

A. Design: NEMA standard, UL listed and CSA approved.

B. Ratings: A/C symmetrical ratings of 50,000 amps for 460 volt equipment and 35000 amps for equipment of lower voltages. Provide higher ratings where available fault current exceeds these ratings and as called for on drawings.

C. Size: In accordance with NEMA standards.

D. Acceptable manufacturers: Allen Bradley, Square D, Eaton, General Electric.

E. Starters shall include melting alloy overloads in each phase, and auxiliary interlocks as required for proper system operation.

F. Provide starters mounted in NEMA 1 general purpose enclosures, unless location of starter dictates other NEMA enclosure. For example, provide NEMA Type 3R enclosures for outdoor use or NEMA Type 7 enclosures for hazardous areas.

G. Provide Hand-Off-Automatic selector switches in each starter.

H. Provide reduced voltage starters as shown on the drawings.
   1. Auto Transformer: Closed transition, 50%, 65%, 80%, taps, set at 50%
   2. Wye-Delta starters: Closed transition type

I. Provide 120 volt control transformers in each starter, individually fused from the line side of the starter using two cartridge fuses and one fuse in the secondary. Size transformers to carry the holding coil circuit and other connected devices.

J. Provide lockable combination starters with motor circuit protectors sized in accordance with the NEC Article 430.

K. Provide built-in power factor correction capacitors on motors 50 horsepower and larger to correct the power factor to 95%. Connect capacitors between the contactor and overload relays.

L. Pushbutton station, selector switches, and pilot lights:
   1. Oiltight, manufacturer's standard unit
   2. Pushbutton station: Momentary contact type with green start button, red stop button, and legend plate
   3. Selector switches: Standard knob maintained contact type with legend plate
   4. Pilot lights: 120 volt lamps with green glass color cap

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install motor starters in accordance with manufacturer's recommendations and requirements of NEC.

B. Provide thermal overloads at system startup in accordance manufacturer's recommendation for specific application.

C. Connect Divisions 21, 22, and 23 equipment ready for operation.

D. Coordinate equipment locations and starter sizes with Divisions 21, 22 and 23 Contract Documents, submittals, and shop drawings.

E. Verify phase rotation of motors with Divisions 21, 22 and 23.

F. Identify starters and controls as required by Section 26 05 00.

END OF SECTION

SECTION 26 41 13

LIGHTNING PROTECTION SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide labor, materials and equipment required for completion of a functional system of air terminals, conductors, grounds, and other components necessary for protection against damage by lightning.

C. System shall be concealed, with only air terminals and roof conductors visible.

D. Provide a UL Inspection Certificate upon completion of work.

1.02 RELATED SECTIONS

A. Division 07: Roofing and flashing.

B. Section 26 05 26: Grounding and Bonding for Electrical Systems

1.03 REFERENCES

A. The lightning protection system shall comply with the latest issue of the following standards.
   1. NFPA 780 Standard for the Installation of Lightning Protection Systems
   2. UL 96A Installation Requirements for Lightning Protection Systems
   3. LPI-175 Lightning Protection Institute

1.04 SUBMITTALS

A. Provide shop drawings, list of material, and details to Engineers for approval prior to commencement of the installation. The drawings shall show the extent of the system layout designed specifically for the contract project.

1.05 QUALITY ASSURANCE

A. The installation shall be by a UL listed installer.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers:
   1. Heary Brothers Lightning Protection, Inc.
   2. Thompson Lightning Protection, Inc.
   3. Robbins Lightning Protection, Inc

4. Harger Lightning & Grounding

2.02 MATERIALS

A. All materials used in the installation shall be new and shall comply in weight, size and composition as required by UL 96A and NFPA 780 and shall be labeled or listed by Underwriters Laboratories Inc. for use in lightning protection systems. The system furnished under this specification shall be the standard product of a manufacturer regularly engaged in the production of lightning protection equipment. The manufacturer shall be listed by UL as a recognized manufacturer of lightning protection components.

B. Class I materials shall be used on structures that do not exceed 75 feet in height and Class II materials shall be used on structures that are 75 feet or higher above average grade.

C. Copper materials shall not be mounted on aluminum surfaces including Galvalume, galvanized steel and zinc; this includes these materials that have been painted.

D. Aluminum materials shall not come into contact with earth or where rapid deterioration is possible. Aluminum materials shall not come into contact with copper surfaces.

2.03 AIR TERMINALS

A. Air terminals shall project a minimum of ten inches above the object or area it is to protect and shall be located at intervals not exceeding 20'-0" along ridges and along the perimeter of flat or gently sloping roofs (flat or gently sloping roofs include roofs that have a pitch less than 3:12). Flat or gently sloping roofs exceeding 50'-0" in width shall be protected with additional air terminals located at intervals not exceeding 50'. Air terminals shall be located within two feet of roof edges and outside corners of protected areas.

B. Air terminals shall be installed on stacks, flues, mechanical units and other metallic objects not located within a zone of protection and which have an exposed metal thickness less than 3/16 of an inch. Objects having an exposed metal thickness 3/16 of an inch or greater shall be connected to the lightning protection system as required by the specified standards using main size conductor and bonding plates having a minimum of 3 square inches of surface contact area.

C. Air terminal bases shall be securely fastened to the structure in accordance with the specified standards including the use of adhesive that is compatible with the surface it is to be used on or stainless steel fasteners.

D. Main conductors shall be sized in accordance with the specified standards for Class I or Class II structures and shall provide a two way horizontal or downward path from each air terminal to connections with the ground system. Conductors shall be free of excessive splices and no bend of a conductor shall form a final included angle of less than neither 90 degrees nor have a radius of bend less than 8 inches.

E. Down conductors shall be sized in accordance with the specified standards and in no case shall be smaller than the main roof conductor. Down conductors shall be spaced at intervals averaging not more than 100 feet around the perimeter of the structure. In no case shall a structure have fewer than two down conductors. Where down conductors are

installed exposed on the exterior of a structure and are subject to physical damage or displacement, guards shall be bonded at each end.

F. In case of structural steel frame construction, down conductors may be omitted and roof conductors shall be connected to the structural steel frame at intervals not exceeding 100 feet along the perimeter of the structure.

2.04 ROOF PENETRATIONS

A. Roof penetrations required for down conductors or for connection to structural steel framework shall be made using thru-roof assemblies with solid riser bars and appropriate roof flashing. Conductors shall not pass directly through the roof. The roofing contractor shall furnish and install the materials required to properly seal all roof penetrations of the lightning protection components and any additional roofing materials or preparations required by the roofing manufacturer for lightning conductor runs to assure compatibility with the warranty for the roof including roof pads that may be required to protect the roof under each of the lightning protection components.

2.05 GROUND TERMINATIONS

A. Ground electrodes shall be copper and a minimum 3/4" diameter and 10 feet long. A ground electrode shall be provided for each down conductor. The down conductor shall be connected to the ground electrode using a bronze ground rod clamp having a minimum of 1-1/2" contact between the ground electrode and the conductor measured parallel to the axis of the ground electrode, or by an Ultraweld exothermically welded connection. Ground electrodes shall be located a minimum of 2 feet below grade and shall be installed below the frost line where possible (excluding shallow topsoil conditions).

B. Where the structural steel framework is utilized as the down conductor for the system, ground terminals shall be connected to columns around the perimeter of the structure at intervals averaging not more than 60 feet apart. Columns shall be grounded using either bonding plates have 8 square inches of surface contact area or by Ultraweld exothermically welded connections.

C. All ground electrodes shall be interconnected with a ground loop conductor on structures that exceed 60 feet in height. The ground loop conductor shall be sized in accordance with the specified standards and in no case shall be smaller than the main roof conductor.

2.06 EQUIPOTENTIAL GROUNDING

A. Common interconnection of all grounded systems within the building shall be ensured by interconnecting to the lightning protection system using main size conductor and fittings.

B. This interconnection shall include but is not limited to the electrical service, telephone and antenna system grounds as well as all underground metallic piping systems including water, gas and sewer. Interconnection to a gas or water line shall be made on the customer's side of the meter. Connection to gas line must be approved by the gas utility.

C. Grounded metal bodies located within the required bonding distance as determined by the bonding distance formula in the latest edition of NFPA-780 Standard for the Installation of

Lightning Protection Systems shall be bonded to the lightning protection system using the required bonding conductors and connections.

2.07 SURGE PROTECTION

A. Surge suppression shall be provided at all power service entrances and at entrances of conductive signal, data and communication services.

PART 3 EXECUTION

3.01 INSTALLATION

A. The installation shall be installed by an UL listed lightning protection installation company that is licensed as a lightning protection installer in the project state.

3.02 COORDINATION

A. Coordinate the installation of the lightning protection system with other trades.

B. Coordinate all roof penetrations, fasteners and adhesive with the roofing contractor prior to installing any materials on the roof.

3.03 INSPECTION AND CERTIFICATION

A. New Structures
   1. Upon completion of the installation of the lightning protection system the contractor shall furnish the UL Certificate of Compliance issued by Underwriters Laboratories Inc.

B. Additions or Renovations
   1. If the protected structure is an addition to or is attached to an existing structure that does not have a functioning lightning protection system, the contractor shall certify that the new system installed complies with the specified standards and shall advise the owner on the lightning protection work required on the existing structure so that a Certificate of Compliance may be obtained.
   2. If the protected structure is an addition to or is attached to an existing structure that does have a lightning protection system the contractor shall advise the owner of any additional work that may be required in order to bring the existing lightning protection system into compliance with the specified standards and thus qualify for a Certificate of Compliance from Underwriters Laboratories Inc.

END OF SECTION

SECTION 26 43 13

TRANSIENT VOLTAGE SURGE SUPPRESSION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with provisions of Sections 26 05 00.

B. Provide three phase surge protection devices (TVSS) as shown on the drawings having the electrical characteristics, ratings and modifications as specified herein.

1.02 RELATED SECTIONS

A. Section 26 05 19: Low Voltage Electrical Power Conductors

B. Section 26 05 26: Grounding and Bonding for Electrical System

C. Section 26 05 33: Raceways and Conduit Systems

D. Section 26 24 13: Switchboards

E. Section 26 24 16: Panelboards

1.03 REFERENCES

A. ANSI/IEEE C62.11 - Standard for Metal-Oxide Surge Arresters for AC Power Circuits

B. ANSI/IEEE C62.33 - Standard Test Specifications for Varistor Surge Protection Devices

C. ANSI/IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Systems

D. ANSI/IEEE C62.45 - IEEE Standard Guide on Surge Testing for Equipment Connected to Low -Voltage AC Power Circuits

E. NEMA Standard LS-1 - Low-Voltage Surge Protective Devices

F. NFPA 70 - National Electrical Code

G. UL 1283 - UL Standard for Safety Electromagnetic Interference Filters

H. UL 1449 - UL Standard for Safety Transient Voltage Surge Suppressors

1.04 SUBMITTALS

A. Submit product data sheets and descriptive bulletins including proof of the following listings:
   1. UL 1283 listing

2. UL 1449 2nd Edition listing
3. Manufacturer ISO 9000 - 2001 certification.

B. Voltage Clamping TVSS devices
1. Submit test data of actual let through voltage for the ANSI/IEEE C62.41, table 4, location category B3/C1 at the 90 degree phase angle tested in accordance with NEMA LS-1 for L-L, L-N, L-G, N-G from a recognized independent testing laboratory.
2. Provide a complete diagram of all devices used in the test including lengths of conductors and where voltages were measured.

C. Sine Wave Tracking TVSS devices
1. Submit test data of actual let through voltage for the ANSI/IEEE C62.41, table 3, location category A1 at the 90 degree phase angle for L-L, L-N, L-G, N-G from a recognized independent testing laboratory.
2. Provide a complete diagram of all devices used in the test including lengths of conductors and where voltages were measured.

D. Provide electrical/mechanical drawings showing the unit dimensions, weights, installation instruction details and wiring configuration for retrofit mounting applications.

PART 2 PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. TVSS Equipment Ratings
1. Provide equipment with AIC rating equal to or greater than the fault current available at the equipment being protected. (Refer to drawings)
2. Provide equipment with each mode rated for the following surge current levels appropriate to the capacity of the equipment being protected:
a. 600-A Bus or less: 120,000-amps service entrance equipment
b. 600-A Bus or less: 40,000-amps non-service entrance

B. TVSS Performance Requirements
1. Voltage Clamping TVSS Device(s). Install on service entrance equipment and on equipment within 30 linear feet of the service entrance as installed in the field.
a. Provide Voltage Clamping levels equal to or less than the following levels for the Category B3/C1 wave at the 90-degree phase angle measured from zero volts to the peak of the let thru:
1) 480/277-volt three phase "wye"
(a) L-L: 1,020-volts
(b) L-N: 590-volts
(c) L-G: 590-volts
(d) N-G: 1,372-volts
2) 208/120-volt, three phase "wye"
(a) L-L: 735-volts
(b) L-N: 425-volts
(c) L-G: 425-volts
(d) N-G: 595-volts

C. TVSS Features
   1. Provide status indicators for each mode on the face of the TVSS enclosure.
   2. Provide safety labels identifying the equipment, UL label, the AIC rating of the equipment and the modes of protection.
   3. Provide dry contacts for remote monitoring.

D. Provide products from the same TVSS manufacturer.

2.02 ACCEPTABLE MANUFACTURERS

A. Control Concepts (Liebert)

B. Surge Suppression, Inc.

C. Current Technology

2.03 WARRANTY

A. Provide a 10 year warranty including materials from the date of owner occupancy in the event of any evidence of failure of the TVSS system.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Wall or equipment mounted TVSS
   1. Mount all three phase TVSS units adjacent (close nippled) to the switchboard/panelboards being protected in a NEMA 12 enclosure.
   2. Install, connect and ground the TVSS device and enclosure in accordance with the manufacturer's instructions, the National Electrical Code and wiring diagrams shown on the drawings.
   3. Provide a 30/3 branch circuit breaker in each panel to be protected for connection of suppressor to panel bus.
   4. Coordinate dry contact connections with fire alarm or energy management vendor. (Refer to drawings)
   5. Provide #10 minimum THHN wire minimized to maximum length of 18" between the device and the circuit breaker.
   6. Provide manufacturer flush mounting kit where required by drawings.

B. TVSS Mounted Integral to Equipment
   1. Coordinate TVSS equipment installation with switchgear/panelboard vendor.
   2. Provide #10 minimum THHN wire minimized to maximum length of 18" between the device and the circuit breaker.

3. Provide a 30/3 branch circuit breaker in each panel to be protected for connection of suppressor to panel bus.
4. Coordinate dry contact connections with fire alarm or energy management vendor. (Refer to drawings)
5. Place all monitoring diagnostic features on the front face of the switchgear mounted devices.

END OF SECTION

SECTION 26 51 13

INTERIOR LIGHTING FIXTURES, LAMPS AND BALLASTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide labor, material, equipment and fixtures for interior lighting including necessary hangers and lamps. Fixtures shall be completely wired, controlled and securely attached to supports.

C. Fixtures and associated components shall be new, of good quality and shall arrive on the jobsite in original packaging.

D. Fixtures shall be listed by a Nationally Recognized Testing Laboratory, and shall meet required local, state and national building codes and regulations. Luminaries installed in exterior locations, unprotected from precipitation, shall be listed for wet location use. Luminaries installed in protected exterior areas or in interior areas subject to extreme humidity shall be listed for damp location use.

1.02 RELATED SECTIONS

A. Section 26 56 00: Exterior Lighting Accessories

1.03 BIDDING AND SUBSTITUTION

A. Comply with the provisions of Division 01.
   1. Bidders requesting approval of brands other than those specified by name/catalog number in that lighting fixture schedule or these specifications shall submit their requests not later than fifteen (15) business days before the scheduled bid due date. Contractors will be notified of approval in the form of an addendum to the bid documents for those products, which have been approved as equal. The Owner has no obligation to review or consider any substitutions after the bid date or pre-bid review period.
   2. Where indicated on schedule, substitution requests shall be accompanied by a working fixture sample - 120V, complete with lamp and cord/plug. These samples shall be shipped separately with return shipment guaranteed at the bidder's expense to the location designated by the Architect. Additional information, including names of projects and contact information (Owner, and Architect/Lighting Designer) for recently completed installations, will be required for these fixtures. If approved, these sample fixtures may not be installed on the project.

B. Provide unit pricing for each specified or alternate fixture to include lamp, freight, and contractor mark-up.

C. The Contractor shall be provided with entire lighting specification (including fixture illustrations and sketches). Contractor shall provide each specified manufacturer with complete information about the luminaries they will supply.

1.04 SUBMITTALS

A. Submit product data for review.

B. Initial lighting submittal shall be complete, clearly indicating fixture manufacturer, model number, voltage, ballast manufacturer, options, finish, mounting type/special mounting details for each fixture specified on the project. The Architect reserves the right to request a shop drawing where information shown on the catalog cut sheets is incomplete. Partial submittals will not be accepted. Re-submittals, where required, may be partial as determined by the submittal review.

C. Where custom fixtures, or row mounted fluorescent fixtures are required on the project, scaled fabrication drawings shall be submitted which indicate ballast locations, internal fixture wiring, support locations, power feed locations, materials and finishes. Contractor shall provide field dimensions for fabrication as required.

D. Submit lamp product data for each specified lamp type.

E. Fixture details shown on contract documents may be modified by the manufacturer if needed, providing all of the following are met:
   1. Fixture performance is equal or improved.
   2. Structural, mechanical, electrical, safety and maintenance characteristics are equal or improved.
   3. Cost to the Owner is reduced or equal.
   4. Modifications are clearly identified on the fixture submittal for Architect review and approval.

F. Fixture submittals shall be arranged numerically as specified.

1.05 QUALITY ASSURANCE

A. Fixtures and workmanship shall be guaranteed free of defects and fully operational for a minimum of one year after project acceptance by the Owner. Any fixtures or workmanship found to be defective during the warranty period shall be replaced by the contractor at no cost to the owner for labor or materials.

B. Fluorescent ballasts shall have an extended three-year manufacturer's warranty against defects in workmanship or material. HID ballasts shall have a two-year warranty against defects in workmanship or material. Warranty shall include in-warranty service program providing for payment of authorized labor charges associated with the replacement of inoperative ballasts within this warranty period.

PART 2 PRODUCTS

2.01 GENERAL MATERIAL REQUIREMENTS

A. ACCEPTABLE MANUFACTURERS
   1. Fixture Manufacturers shall be as indicated on fixture schedule.
      a. Fluorescent Troffers:
         1) Columbia
         2) Lithonia
         3) LSI/Innovator
         4) Metalux
         5) Williams
         6) Daybrite
      b. Downlights:
         1) Prescolite
         2) Lithonia/Gotham
         3) Spectrum
         4) Omega
      c. Exit Lights and Egress Lights:
         1) Dual-Lite
         2) Lithonia
         3) Emergi-lite
         4) McPhilben

B. Luminarie hardware shall be concealed. Fasteners shall be manufactured of non-magnetic stainless steel or anodized aluminum, except in indoor applications where galvanized steel shall be acceptable.

C. Fixtures shall be free of light leaks and shall be designed to provide sufficient ventilation of lamps and ballasts including vent holes where required. Exterior fixtures shall have wire mesh corrosion resistant screens in the vent holes.

D. Fixture housings for linear fluorescent lamps shall be No. 22 gauge steel, bonderized or equal rust protection, or No. 16 gauge aluminum rigid construction, suitable for continuous row mounting where indicated.

E. Fixture housings for incandescent or HID lamps shall be:
   1. Interior locations
      a. No. 20 gauge steel, bonderized or equal rust protection, or
      b. No. 16-gauge aluminum rigid construction.
   2. Exterior locations
      a. No. 18 gauge steel, bonderized or equal rust protection, or
      b. No. 14-gauge aluminum rigid construction.

F. Fixtures shall be constructed with a minimum number of joints. Exposed metal joints shall be welded, filled with weld material, ground smooth and made free of light leaks. Unexposed joints shall be welded, screwed or bolted. Soldered joints are not acceptable. Self tapping methods or rivets for fastening removable parts used to gain access to

electrical components requiring service or replacement, or for fastening electrical components or their supports, will not be acceptable.

G. Sheet metal work shall be free from tool marks and dents and shall have accurate angles bent as sharp as compatible with the gauges of the required metal. All intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after assembly. Edges shall be finished such that no sharp edges are exposed. Miters shall be in accurate alignment. Sheet metal work shall be properly fabricated so that planes will not deform due to operating and varied weather conditions.

H. Cast or extruded parts of luminaries shall be close grained, rigid, true to pattern, of ample weight and thickness, and properly fitted, filed, ground, and buffed to provide finished surfaces and joints free of imperfections or discolorations.

I. Housings for fluorescent and HID fixtures shall be designed to ensure electrical components are easily accessible and replaceable, without removing the fixture body from its mounting.

J. Finishes
   1. Ferrous mounting hardware and accessories shall be finished using either a galvanic or phosphate primer/baked paint process to prevent corrosion and discoloration of adjacent materials.
   2. For weatherproof and vapor tight installations, painted finishes of fixtures and accessories shall be weatherproof enamel using proper primers or hot dipped galvanized and bonderized epoxy, in accordance with the manufacturer's requirements. Finish of painted surfaces shall have a life expectancy of not less than twenty years.
   3. Finishes for interior luminaries shall be baked enamel unless specified otherwise. Concealed interior and exterior surfaces, including hardware, yokes, brackets, etc., shall be finished matte black.
   4. Pendant hangers, where required, shall be chemically resistant, weatherproof baked enamel finish.
   5. Where aluminum parts come in contact with bronze parts, apply to both surfaces a coating material to prevent corrosion.

K. Fixtures with an adjustable lamp and using a lamp with an asymmetrical light pattern shall have an aiming stop which can be permanently set so that the lamp shall remain correctly positioned after service or relamping.

L. Fixtures shall be designed, manufactured and wired to conform to NEC article 300.22 where the fixtures are recessed in a hung ceiling, and the space above the ceiling is utilized for supply or return air plenum.

M. Incandescent luminaries shall include a thermal protection device as required by NEC 410.65.

2.02 LAMPHOLDERS

A. Lampholders shall be rigidly and securely attached to the luminaire and shall hold lamps securely against normal vibrations and maintenance handling. Lampholders shall be

suitable for specified lamps, and set to position the lamps in optically correct spacing and relationship to lenses, reflectors, filters and baffles.

1. Lampholders for incandescent, HID and halogen lamps shall be porcelain with nickel-plated copper screw shells.
2. Lampholders for pulse-start Metal halide shall be 4 kV pulse-start rated, porcelain with nickel-plated copper screw shells.
3. Lampholders for fluorescent shall be white heat-resistant plastic. Lampholders intended for operation with an open circuit voltage in excess of 300 volts shall be the safety type, designed to open the supply circuit when the lamp is removed from the socket. Where fluorescent lamps are installed in unenclosed fixtures, a minimum of two lamp retaining clips per lamp shall be provided.

2.03 REFLECTORS

A. Reflector Cones:
   1. Provide 45 degree lamp and lamp image cut-off unless otherwise specified. In fixtures where upper reflector is separate from cone, cut-off shall be 45 degrees unless otherwise specified.
   2. Reflector cone retention devices shall not deform the cone in any manner.
   3. Plastic materials shall not be used for reflector cones or aperture plates.
   4. Fixtures, which require pressure to be applied to the finished surface of the reflector in order to remove the reflector, are not acceptable.
   5. Ceiling flange shall be formed as an integral part of the cone or fixture reflector assembly and shall have identical color and finish as the cone, except as scheduled. The flange surface shall be perpendicular to the cone axis and shall be of appropriate width to adequately cover the ceiling opening without light leaks, or visibility of fixture housings.

B. Aluminum Reflectors:
   1. Aluminum reflectors and reflecting cones shall be manufactured of uniform gauge, not less than 0.032" thick, high purity aluminum Alcoa 3002 alloy free of spin marks or other defects or blemishes caused during manufacture. No riveting or springs shall be visible after installation. The reflector inner surface shall have an anodic coating of not less than four mils thick. The inner surface shall be free of water spotting and shall maintain a reflectivity ratio of not less than 83 % on clear specular finish. The reflector shall have a low iridescent finish free from multiple colors seen from normal viewing angles.
   2. Luminaries provided with tri-phosphor type lamps shall be provided with low iridescence aluminum reflectors to eliminate discoloration on aluminum reflectors.
   3. The reflecting surface of the cone shall be tested for proper sealing per ASTM B136-63T.

C. Painted Reflectors:
   1. Painted reflectors shall be formed before application of primer and paint. Finish process for reflectors and reflector cones for luminaries with baked white enamel finish shall meet the following requirements.
      a. After 100 hours of exposure to fade-o-meter, reflectance shall be not less than 85%, and finish shall show no visible color change.
      b. After 100 hours of exposure to 100% humidity at 100 degrees F, finish shall show no blistering or other degraded effects.

c. After 150 hours of exposure to salt spray (20% sodium chloride) shall cause not breakdown of film.

2.04 LENSES

A. Lenses, louvers and other light diffusing components shall be contained in frames. Components shall be removable but positively held within the frames so that hinging or other motion of the frame will not cause the diffusing component to drop out. This safety device shall be detachable if necessary and shall not interfere with the fixture performance, maintenance, or the seating of any fixture element, and shall not be visible during normal fixture operation.

B. Fresnel:
   1. Lens shall have uniform brightness throughout the entire visible area at angles from 45 degrees to 90 degrees from vertical, without bright spots or striations.
   2. Lens shall have opaque risers - color as specified in schedule.
   3. Finish of visible regress surface of door shall be matte baked enamel paint - color as specified in schedule.

C. Glass:
   1. Flat glass lenses shall be heat tempered borosilicate glass unless otherwise noted.
   2. Provide clear glass safety lens in metal halide fixtures unless noted otherwise.
      a. Glass finish (i.e. sandblasting, etching, polishing) shall be as scheduled.

D. Acrylic:
   1. Lenses shall be of injection molded crystal clear 100% virgin acrylic, .125 thickness.
      a. For lenses with female pattern, specified thickness refers to overall thickness of material. (Example: A12.125 lens refers to a .125 nominal thickness)
      b. For lenses with male pattern of pyramids (cones), specified minimum thickness refers to distance from flat surface to base of pyramids (cones), or thickness of undisturbed material. (Example: A19 lens)
   2. Lenses shall fully eliminate lamp images when viewed from all directions within the 45-degree to 90-degree angle from vertical when the ratio of lamp spacing to the distance from lamp underside to top of lens does not exceed 1.5. Within the viewing angle from 0 to 45 degrees, the ratio of maximum brightness (under a lamp) to minimum brightness (between lamps) shall not exceed 3 to 1.
   3. Lenses shall produce a VCP or at least 65 based on a 30 x 30 room with 80/50/20 reflectances lit to 100 footcandles (verified by and independent laboratory.)
   4. Lenses shall produce no more than 585 footlamberts of brightness in the critical 65-degree zone.
   5. Finishes (i.e., sandblasting, etching, polishing) shall be as scheduled.

2.05 PARABOLIC AND FLAT BLADE LOUVERS

A. Louvers shall be continuously bound in channel formed frame, finish and color as scheduled.

B. Louver shall provide a minimum visual cut-off to the lamp of 45 degrees.

C. The finish of the visible surface of the reflector shall be highly specular as described above for the Alzak process.

D. For flat blade louvers, blade thickness shall be a minimum of .125" flat steel.

2.06 BALLASTS

A. FLUORESCENT
1. Unless indicated otherwise on fixture schedule, linear fluorescent lamp ballasts shall be Instant Start
2. Provide 2, 3 or 4-lamp ballasts as required for the number of lamps in each fixture unless indicated otherwise on drawings. Where dual switching of multiple lamp fixtures is shown on drawings to provide variable light intensities, provide multiple ballasts per fixture as required to accomplish the switching arrangement shown.
3. Acceptable Manufacturers
   a. Instant Start
      1) 20% THD-T8 lamps: Advance REL series (120V), VEL series (277V) or equivalent by Magnetek, Motorola, Osram/Sylvania.
      2) 10% THD-T5/T8 lamps: Advance RCN series (120V), VCN series (277V) or ICN series (dual 120/277V) or equivalent by Magnetek, Motorola, Osram/Sylvania
   b. Programmed Start -
      1) Advance Mark V (2F32T8) RIC-2S32
      2) Advance Centium (2F28T5) RCN-2S28 or equivalent by Magnetek, Motorola, Osram/Sylvania
   c. Rapid Start - 20% THD-T8, T8/HO lamps: Advance GEL series or equivalent by Magnetek, Motorola, Osram/Sylvania
      1) 10% THD-T8 lamps: Advance GCN series or equivalent by Magnetek, Motorola, Osram/Sylvania
   d. Program Rapid Start -
      1) 10% THD-T8 lamps: Advance RCN series (120V), VCN series (277V) or equivalent by Magnetek, Motorola, Osram/Sylvania
   e. Programmed Start Dimming -
      1) (0-10 volt dimming) Advance Mark VII series, Motorola Helios, Lutron Eco-10
      2) (Line Voltage dimming) Advance Mark X series, Lutron Hi-Lume
4. Ballasts shall be high frequency electronic type, and shall operate lamps above 42 kHZ to avoid interference with infrared devices.
5. Ballasts shall operate from 60 Hz input source of 120 or 277 volts and be capable of withstanding sustained variations of +/- 10% in voltage and frequency without damage to ballasts. Ballasts shall tolerate sustained open circuit and short circuit output conditions without damage. Ballasts shall provide transient immunity as recommended by ANSI C62.41.
6. Ballasts shall comply with ANSI C82.11; FCC Part 18 Non-Consumer Equipment, Class A for EMI;
7. Ballasts shall have a Class A+ sound rating.
8. Input current Total Harmonic Distortion (THD) shall not exceed 10% for non-dim primary lamp applications, and 10% for dimming applications.

9. Ballasts shall operate lamps with no visible flicker (<3% flicker index).
10. Minimum ambient temperature for lamp start shall be 0 degrees F.
11. Lamp Current Crest factor shall be 1.7 or less in accordance with lamp manufacturer recommendation for non-dim applications, and 1.6 or less for dimming applications.
12. T8 and T5 Ballasts shall have a Power Factor of .98 or greater for primary lamp applications. Dimming ballasts shall have a Power Factor of .98 or greater at full light output and greater than .90 throughout the dimming range. Compact fluorescent ballasts shall have a Power Factor of .96 or greater.
13. Ballasts shall have a minimum Ballast Factor for primary lamp applications per ANSI C82.11 as listed below:
    a. T8 normal light output: 0.85
    b. T8 low wattage: 0.75
    c. T8 High light output: 1.2
    d. T5 and T5HO: 1.00
    e. Dimming Ballasts with 0-10Volt control: range 0.88-0.05 (100% to 5% relative light output)
    f. Dimming Ballasts with powerline control: range 1.0-0.05 (100% to 5% relative light output)
    g. T4 and T5 Compact fluorescent 13W- 42W: 0.93
14. Compact fluorescent, T5 and T5HO ballasts shall incorporate lamp shutdown circuitry for end of lamp life protection. Ballasts shall allow for relamping without the need to cycle power.
15. Ballasts in exterior fixtures shall be UL935 listed, Class P, Type 1 Outdoor rated.

B. HID
1. CWA
    a. Ballasts shall be designed in accordance with all applicable ANSI specifications including C82.4. Ballasts shall be manufactured in an ISO 9002 and ISO 14001 certified facility.
    b. Core & Coil ballasts shall be designed with class "H" (180 degree) or higher insulation system and vacuum-pressure impregnated with a silica-filled polyester resin.
    c. Core & Coil ballasts shall be designed to operate for 60,000 hours of continuous operation at their maximum rated temperature.
    d. Core & Coil ballast and starter combinations shall be designed to provide a reliable lamp starting down to -40 degrees C for high pressure sodium, and -30 degrees C for metal halide at nominal line voltage +/- 10%.
    e. Ballasts shall have a nominal ballast factor of 1.0.
    f. Ballasts shall completely enclose all live parts.
    g. Ballast igniters shall be designed to provide six months of lamp open circuit operation without failure.
    h. Ballast igniters shall be designed to withstand 10,000 hours of continuous pulsing.
2. Electronic (Pulse Start)
    a. Lamp Current Crest Factor shall be 1.5 or less in accordance with lamp manufacturer recommendation.
    b. Ballast shall tolerate operation of up to 85 degrees C case temperature without damage.
    c. Ballast shall have a nominal ballast factor of 1.0.

d. Input current THD shall not exceed 15% for the primary lamp.
e. Ballasts shall have a power factor greater than .90.
f. Ballast shall have a Class A sound rating. Ballast shall be acoustically isolated from housing using mounting pads to minimize vibration and noise level.
g. Ballast shall be thermally protected and incorporate lamp shutdown circuitry for end of lamp life protection.
h. Ballast shall operate in ambient temperatures as low as -20 degrees F.
i. Ballast shall operate lamps at a frequency of less than 200 Hz to minimize acoustic resonance inside the lamp arc tube and to minimize lamp flicker.
j. Ballast shall be manufactured in an ISO 9002 certified facility.

2.07 FIXTURE WIRING

A. Voltage rating for conductors shall be 300 volts minimum for fixtures designed to operate at 120 Volts or less, and shall be 600 volts minimum for fixtures designed to operate above 120 volts.

B. Wiring shall be code-approved for fixture wiring, and shall comply with the minimum temperature ratings mandated by recognized testing agency.

C. Flexible cord wiring between fixture components or to electrical receptacle, which is not enclosed in wireway, shall have a minimum temperature rating of 105 degrees C. Cord shall be suitable for the application and shall be fitted with proper strain relief and watertight entries where required by the application.

D. Splices within fixtures shall be made within separate splice compartments, and shall utilize nylon insulated crimped connections or quick disconnect devices. Splices to branch circuit shall be made using flame retardant thermoplastic wire nuts with fully seated helical metal spring and threaded entry.

2.08 LAMPS

A. Lamps shall be as indicated on the lighting fixture schedule. Except as specified otherwise, lamps shall be of the same manufacturer throughout the project.

B. A complete set of new lamps shall be provided for each fixture in the project. Where fixtures are installed and utilized for testing before substantial completion, the required set of new lamps shall be installed no earlier than one month before scheduled substantial completion. Contractor shall provide lamps for use if fixtures must be utilized earlier in the project.

C. Fluorescent lamps shall be as manufactured by Philips, Osram/Sylvania or GE. Provide the same lamp color and CRI as indicated below throughout the project except as scheduled otherwise:
1. 3500 degree K, 75 CRI or greater

D. Incandescent Lamps shall be 130 volt rated (Extended / Rough service) operated at 120 volt where available.

E. Metal halide lamps for indoor applications shall include:
   1. Coated type with CRI of 70 or greater with color shift not to exceed +/- 400 degrees K for mogul base, or +/- 200 degrees K for medium base (Equal to GE, Philips, Osram, Venture)
   2. Stabilized color, coated with CRI greater than 80 (Equal to GE ConstantColor, Philips MasterColor

F. Provide pulse start lamps for pulse start fixture types.

G. Metal Halide lamps for outdoor applications shall be clear.

2.09 EMERGENCY TRANSFER AND BATTERY PACKS

A. Emergency lighting shall be provided with an emergency ballast. Ballast shall delay AC ballast operation for five seconds to prevent false tripping of AC ballast end-of-life shutdown circuits. Emergency ballast shall consist of a high-temperature, maintenance-free nickel-cadmium battery, charger and electronic circuitry contained in one galvanized steel case.

B. A solid state charging indicator light to monitor the charger and battery, a single-pole test switch, and installation hardware shall be provided, and shall be completely assembled in the luminaire.

C. Where emergency fixtures are installed in locations inaccessible from a 15-foot ladder, the test switch shall be installed remotely in location as determined by the Architect or as indicated on drawings.

D. The emergency ballast shall be capable of providing the lumen output as indicated below. Acceptable manufacturer: Bodine, Iota Engineering, Side-Lite, DualLite. (Bodine model numbers are listed for quality standards.)
   1. 450 total lumens for straight lamps : Bodine B100 (Code Compliant minimum)
   2. 600 total lumens for straight lamps : Bodine B90
   3. 700 total lumens for straight lamps : Bodine B60
   4. 1350 total Lumens for straight lamps: Bodine B50 (High lumen output)
   5. 3500 total lumens for straight lamps or 4-pin compact fluorescent: Bodine B30 (Full lumen output)
   6. 950 Lumens for 2 pin compact fluorescent: Bodine B426 (High lumen output)
   7. 1050 Lumens for use with dimming ballasts: Bodine B84C (High lumen output)

E. The emergency ballast shall be capable of providing the lumen output as indicated below. Acceptable manufacturer: Bodine, Iota Engineering, Side-Lite, DualLite. (Bodine model numbers are listed for quality standards.)
   1. Provide 100% full light output (3500 total lumens) for straight lamps in designated operating room fixtures. Provide a single wall-mounted test switch, Bodine KTS-PL, which will simultaneously test multiple battery units.

F. Where Emergency lighting is connected to a generator, but where time delay for lamp restart is not acceptable, provide short duration battery packs for indicated fixtures which

will provide continuous light output until generator start-up and transfer is completed. Battery pack shall be capable of providing the lumen output as indicated below.

1. 3200 lumens for a single straight or long compact fluorescent lamp: Bodine GEN1
2. 7900 total lumens for multiple straight or long compact fluorescent lamps: Bodine GEN3.

G. Where Emergency lighting is connected to a generator, but must also be controlled locally, provide a transfer device for each fixture, which will bypass the local control upon loss of normal power source. Device shall be mounted within the associated fixture and shall be warranted by the manufacturer for five years. Unit shall be UL listed as a transfer device, equivalent to Bodine GTD or approved equal.

2.10 ATTIC STOCK

A. Provide one case of each lamp type utilized in the project and turn over to owner at project completion.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Scheduling of fixture installation shall be coordinated with other trades such that the fixtures will be protected from construction and dirt/water/debris damage. Fixtures, which are damaged, shall be replaced at no cost to the owner.

B. Fixtures shall be securely mounted as required by NEC and manufacturer recommendation.

C. Coordinate with ceiling system contractor for the installation of ceiling support wires at two opposing corners of recessed troffer fixtures.

D. Support fixtures in seismic zones as detailed on drawings.

E. Fixtures shall be located and installed as shown on architectural reflected ceiling plans. Coordinate with other trades to allow fixture locations to clear diffusers, ductwork and piping.

F. Coordinate final locations and mounting heights of fixtures within mechanical and electrical rooms with units, duct, conduit, and cable tray routings for optimal performance of specified fixtures. Maintain access for servicing of luminaire components.

G. Determine type of ceiling to be installed in each space from architectural drawings and schedules and furnish fixtures suitable for the exact ceiling type.

H. Receive, store, uncrate, install and lamp fixtures shown in schedule on drawings or indicated to be furnished by others.

I. Recessed fixtures in dropped ceiling areas shall be connected using flexible conduit. Conduit shall be connected to fixture and outlet box. Each piece shall have a separate insulated green grounding conductor not smaller than No. 14 for grounding continuity

between fixture and conduit system. Grounding conductor shall be mechanically connected in a permanent and effective manner to fixture and conduit system and be electrically continuous. No conduit shall enter a recessed fixture directly as this method prevents removal of fixture without disturbing balance of circuit.

J. Recessed fixtures installed in exposed or concealed tee bar ceilings may used ceiling grid to support fixtures. Fixtures shall be securely fastened to ceiling framework using approved clips per NEC.

K. Recessed and surface fixtures in or on concealed Z-spline ceilings shall be supported from the building structure.

L. Recessed and surface fixtures in or on plastered or drywall ceilings shall be supported from support channel spanning across main support channels and shall not depend on ceilings for support. Fixtures in plastered or dryvit ceilings shall have plaster frames.

M. Maintain integrity of enclosures on enclosed and gasketed fixtures. Minimize number of enclosure penetrations and make such penetrations water and dust tight with appropriate gasketing and fittings.

N. Where fixtures are served from multiple circuits (i.e. normal and night/emergency operation or large loads which are dual level switched), each branch circuits shall be provided with a separate neutral conductor back to the associated panelboard.

O. Provide fire-rated enclosures around recessed luminaries, which are installed in fire, rated ceiling assemblies.

P. Coordinate length of continuous-run fluorescent fixtures with actual cove, wall, coffer, partition dimensions.

Q. Replace noisy ballasts as directed by the Architect.

R. Parabolic luminaries shall be installed with Mylar cover over louvers. Cover shall be UL listed for temporary lighting. Upon completion or work, remove Mylar cover with white gloves.

S. Upon final building cleaning, clean the lenses, baffles, louvers, reflector cones and bottoms of the trims of all lighting fixtures. Use soft, non-abrasive cloth and a cleaning solution as recommended by the fixture manufacturer. Luminaire components whose finishes are damages shall be replaces at no cost to the Owner.

3.02 AIMING AND ADJUSTMENTS

A. Adjustable fixtures shall be adjusted by the Contractor to illuminate intended area to the satisfaction of the Owner. Labor, equipment and other materials necessary to perform aiming shall be provided as needed.

B. Exterior adjustable fixtures shall be adjusted at night by the Contractor to illuminate intended area to the satisfaction of the Owner. Labor, equipment and other materials necessary to perform aiming shall be provided as needed.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide labor, materials, equipment and fixtures for exterior lighting, including, lamps, poles and pole bases, for:
   1. Parking lot and access roads
   2. Exterior signage
   3. Walkways and exterior building lights

C. Refer to details and arrangements shown on drawings.

D. Concrete bases will be installed under other Divisions. Coordinate proper size of bases, anchor bolts and conduit stub-ups.

E. Where seismic conditions exist, provide concrete bases as indicated in the detail on drawings.

F. Fixtures and poles shall be suitable for exterior use, shall be UL listed, and shall be a standard design for exterior application.

1.02 RELATED SECTIONS

A. Section 26 51 13: Interior Lighting Fixtures, Lamps, and Ballasts

B. Division 03: Concrete

C. Division 09: Painting

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are those shown in lighting fixture schedule on drawings.

B. For contactors: Square "D", General Electric, Allen-Bradley, Cutler Hammer.

C. For Photo Cells: Tork, model no. 2101.

2.02 MATERIALS

A. Luminaries, including all components, shall be designed to meet extreme temperature (low), moisture, and wind conditions in area of project.

B. Poles: Steel, round or square, designed for 100 MPH constant velocity wind load.
   1. Include base template, 4 anchor bolts, cadmium plated hardware and pole grounding lug, handhole, cast steel anchor base and bolt covers.
   2. Finish: Factory primed, supplier to furnish sufficient paint for adequate field painting of two coats. Application of paint shall be accomplished under Division 09.

C. Ballast shall be UL listed high power factor, designed for -20 F starting.

D. Diffusers shall be 100 percent virgin acrylic Plexiglas. Hardware and fasteners shall be corrosion resistant.

E. Pole wiring from base to ballast shall be No. 12 with fuse protection by a 30 A, 600 volt Tron waterproof fuseholder, Bussmann "Limitron" fuse, size rating 3 times load current.

F. Contactors: Mechanically held type, main contacts rated for 480 volts and ampacity required, 120 volt operating coil, designed for tungsten, fluorescent, metal halide, high pressure sodium or mercury lamp loads.
   1. Provide NEMA 1 enclosure
   2. Square D, Class 8903

G. Photo Cells shall be 120 volt, enclosed, weatherproof type for outdoor application.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install photo cells above roof with cells facing north.

END OF SECTION

PROJECT MANUAL

TENNESSEE STATE UNIVERSITY
FOOTBALL PRACTICE FACILITY

PREPARED FOR:
OWNER

TENNESSEE BOARD of REGENTS
OFFICE of FACILITIES DEVELOPMENT
NASHVILLE, TENNESSEE 37217-2833

SBC Project No. 166/001-03-2007

PREPARED BY:
DESIGNER

MOODY•NOLAN INC.
ARCHITECTS • ENGINEERS • PLANNERS
1625 BROADWAY, 4TH FLOOR

NASHVILLE, TENNESSEE 37203
615-386-9690 FAX 615-386-0528

CONSULTING ENGINEERS:

LITTLEJOHN ENGINEERING ASSOCIATES
CIVIL ENGINEERING

EMC STRUCTURAL ENGINEERS, P.C.
STRUCTURAL ENGINEERING

SMITH SECKMAN REID, INC
MECHANICAL AND ELECTRICAL ENGINEERING

CONSTRUCTION DOCUMENTS
November 19, 2009

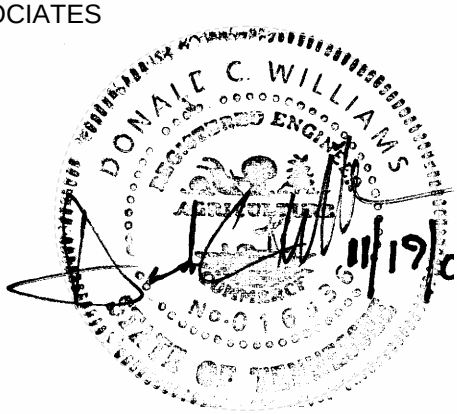
PROJECT DIRECTORY AND DESIGNERS' SEALS

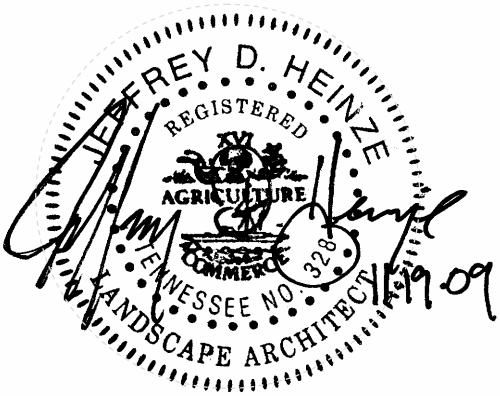
PROJECT:
TENNESSEE STATE UNIVERSITY
Football Practice Facility
3500 John A. Merritt Boulevard
Nashville, Tennessee 37209
SBC Project No. 166/001-03-2007

OWNER
TENNESSEE BOARD of REGENTS
Office of Facilities Development
Suite 664 (6th Floor SW) Genesco Park
1415 Murfreesboro Road
Nashville, Tennessee 37217-2833

ARCHITECT (DESIGNER)
MOODY•NOLAN, Inc
1625 Broadway, 4th Floor
Nashville, Tennessee 37203
Phone: (615) 386-9690
Fax: (615) 386-0528
Contact: Brian Tibbs
Email: btibbs@moodynolan.com

CIVIL ENGINEER / LANDSCAPE ARCHITECT
LITTLEJOHN ENGINEERING ASSOCIATES
1935 Twenty-First Avenue South
Nashville, Tennessee 37212
Phone: (615) 385-4144
Fax: (615) 385-4020
Contact: Travis Todd
Email: ttodd@leainc.com

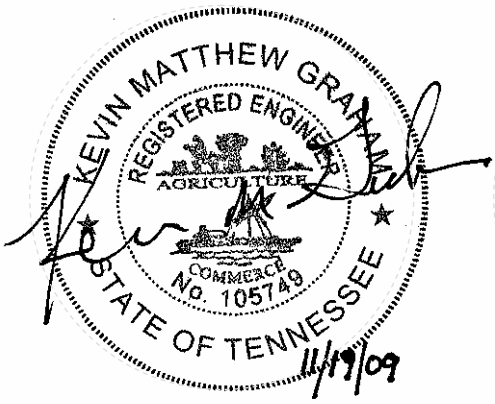


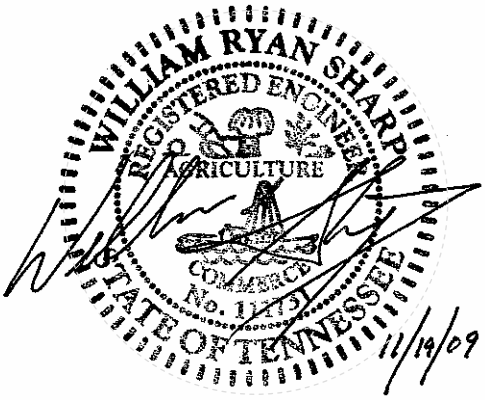


STRUCTURAL ENGINEER
EMC STRUCTURAL ENGINEERS
4525 Trousdale Drive
Nashville, Tennessee 37204
Phone: (615) 781-8199
Fax: (615) 781-4088
Contact: Dan Borsos
Email: danb@emcnashville.com

MECHANICAL / PLUMBING / ELECTRICAL ENGINEERS

SMITH SECKMAN REID, INC.
2995 Sidco Drive
Nashville, Tennessee 37204
Phone: (615) 383-1113
Fax: (615) 386-8469
Contact: Matt R. Clark
Email: mclark@ssr-inc.com





ADDITIONAL CONSULTANTS

SYNTHETIC ATHLETIC FIELD SURFACING

HFR DESIGN, INC.
7101 Executive Center Drive, Suite 300, P.O. Box 1974
Brentwood, Tennessee 37024-1974
Phone: (615) 370-8500
Fax: (615) 370-8530
Contact: Jim Gilliam
Email: JGilliam@hfrdesign.com

END OF SECTION

TABLE OF CONTENTS

			Pages
	Cover Sheet		
00 01 07	Project Directory and Designers' Seals		2
00 01 10	Table of Contents		5
00 01 15	Index of Drawings		2

DIVISION 0 – PROCUREMENT AND CONTRACTING REQUIREMENTS

BIDDING REQUIREMENTS

00 11 16	Invitation to Bid	[TBR]	1
00 21 13	Instructions to Bidders	[TBR]	3
00 22 20	Map to the Bid Opening Location	[TBR]	1
00 31 32	Geotechnical Information Available to Bidders	[TBR]	1
00 38 60	Disqualified Contractors and Subcontractors	[TBR]	1
00 41 13	Bid Form	[TBR]	2

CONTRACTING REQUIREMENTS

00 52 13	Agreement	[TBR]	4
00 54 33	ACH Credits Form	[TBR]	1
00 54 35	Substitute W-9 Form	[TBR]	1
00 61 13	Contract Bond	[TBR]	2
00 61 43	Three Year Roof Bond	[TBR]	2
00 72 13	General Conditions – AIA A201 (*TBR modified version*)	[TBR]	51
00 73 43	Prevailing Wage Rates	[TBR]	2
00 73 46	Wage Determination Form	[TBR]	3

DIVISION 1 - GENERAL REQUIREMENTS

01 11 00	Summary of Work		2
01 23 00	Alternates	[TBR]	1
01 26 00	Contract Modification Procedures	[TBR]	1
01 26 20	Weather Delays	[TBR]	2
01 26 25	Weather Delay Report	[TBR]	1
01 26 40	Forms for Amendment, Change Order or Directive	[TBR]	1
01 26 50	Forms for Itemization	[TBR]	3
01 29 73	Schedule of Values	[TBR]	1
01 29 76	Applications and Certificates for Payment	[TBR]	2
01 31 19	Project Meetings	[TBR]	1
01 31 90	Administrative Logs	[TBR]	1
01 32 15	Progress Schedules and Reports	[TBR]	1
01 33 23	Shop Drawings, Product Data and Samples		4
01 41 15	Basic Regulatory Requirements	[TBR]	1
01 43 25	Testing Laboratory Services	[TBR]	1
01 45 00	Quality Control		1
01 50 00	Temporary Facilities and Controls		8
01 60 00	Product Requirements		5
01 62 25	Product Options and Substitutions	[TBR]	1
01 62 32	Substitution Request Form	[TBR]	2

01 73 00	Execution Requirements		6
01 73 29	Cutting and Patching		3
01 74 00	Cleaning		4
01 77 70	Close-out Procedures	[TBR]	2
01 78 21	Close-out Submittals	[TBR]	1
01 78 25	Data Binder Receipt	[TBR]	1
01 78 36	Roofing System Warranty	[TBR]	3
01 78 88	Report of Subcontractors and Suppliers	[TBR]	1
01 79 21	Demonstration and Training	[TBR]	1
01 79 25	Demonstration and Training Verification	[TBR]	2

DIVISION 2 – EXISTING CONDITIONS

No sections required

DIVISION 3 - CONCRETE

03 30 00	Cast-In-Place Concrete	16

DIVISION 4 - MASONRY

No sections required

DIVISION 5 - METALS

Refer to Section 13 34 19 for Metal Building Systems Structural Framing and Components

05 50 00	Miscellaneous Metals	6

DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

06 10 00	Rough Carpentry	6
06 61 17	Solid Surface Countertops	4

DIVISION 7 - THERMAL & MOISTURE PROTECTION

07 11 13	Bituminous Dampproofing	3
07 21 00	Thermal insulation	4
07 26 00	Below-Grade Vapor Barriers	2
07 62 00	Flashing and Sheet Metal	5
07 84 00	Firestopping	10
07 92 00	Sealants	7

DIVISION 8 - DOORS & WINDOWS

08 11 13	Hollow Metal Doors and Frames	6
08 14 00	Wood Doors	5
08 33 23	Overhead Coiling Doors	5
08 41 13	Aluminum-Framed Entrances and Storefronts	8
08 71 00	Finish Hardware	13
08 81 00	Glass Glazing	6

DIVISION 9 - FINISHES

09 21 16	Gypsum Board Systems		13
09 30 00	Tile		8
09 51 13	Acoustical Panel Ceilings		4
09 65 00	Resilient Flooring		5
09 91 00	Painting		13

DIVISION 10 - SPECIALTIES

10 14 10	Interior Signage		5
10 14 16	Dedication Plaque		2
10 21 14	Plastic (Phenolic) Toilet Compartments		4
10 22 26	Folding Panel Partitions	*[Alternate #1]*	3
10 28 13	Toilet Accessories		4

DIVISION 11 - EQUIPMENT

11 52 13	Projection Screens	*[Alternate #1]*	2
11 66 26	Wall Padding		1

DIVISION 12 - FURNISHINGS

12 33 55	Plastic Laminate Faced Casework	*[Alternate #1]*	8

DIVISION 13 - SPECIAL CONSTRUCTION

13 34 19	Pre-Engineered Metal Building System		8

DIVISION 14 - CONVEYING EQUIPMENT

No Sections Required

DIVISION 21 - FIRE SUPPRESSION

21 05 00	Common Work Results For Fire Suppression		8
21 05 20	Fire Extinguishers, Fire Valves and Cabinets		2
21 05 53	Identification for Fire-Suppression Piping and Equipment		2
21 13 13	Fire Suppression Sprinkler Systems		6
(211313)	Fire Protection Calculations		7

DIVISION 22 - PLUMBING

22 05 00	Common Work Results for Plumbing		10
22 05 23	Valves for Plumbing Piping		2
22 05 29	Hangers for Plumbing Piping		3
22 05 53	Identification of Plumbing Piping and Equipment		2
22 07 00	Plumbing Insulation		3
22 11 16	Domestic Water Piping		5
22 11 19	Domestic Water Piping Specialties		2
22 13 16	Sanitary Waste and Vent Piping		2

22 13 19	Sanitary Waste Piping Specialties	3
22 33 36	Water Heater - Electric	2
22 40 00	Plumbing Fixtures	6

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING

23 05 00	Common Work Results for HVAC	11
23 05 13	Motors for HVAC	4
23 05 14	Variable Frequency Motor Drives	8
23 05 29	Pipe Hangers	3
23 05 48	Vibration Isolation	4
23 05 53	Identification for HVAC Equipment	2
23 05 93	Testing, Adjusting and Balancing for HVAC	8
23 07 00	HVAC Insulation	3
23 09 13	Instrumentation and Control Devices	7
23 09 23	Building Automation and Direct Digital Controls	25
23 11 23	Facility Natural Gas Piping	2
23 20 00	HVAC Piping	4
23 23 00	Refrigeration Piping System	2
23 31 13	Sheetmetal Ductwork	7
23 33 00	Air Duct Accessories	5
23 34 18	In-Line Tubular Centrifugal Fans	2
23 34 36	Propeller Fans	2
23 41 00	Particulate Air Filtration	2
23 73 50	Air Rotation Units	4
23 81 26	Split System A/C Units	2
23 82 39	Unit Heaters	2

DIVISION 26 - ELECTRICAL

26 05 00	Common Work Results for Electrical	8
26 05 19	Low Voltage Electrical Power Conductors	4
26 05 26	Grounding and Bonding for Electrical Systems	2
26 05 29	Hangers and Supports for Electrical Systems	2
26 05 33	Raceways and Conduit Systems	4
26 05 34	Pull and Junction Boxes	2
26 05 35	Outlet Boxes	3
26 05 43	Underground Ducts and Raceways for Electrical Systems	3
26 05 44	Prefabricated Concrete Manhole	6
26 05 53	Identification for Electrical Systems	2
26 05 73	Power System Analysis	7
26 22 13	Low Voltage Distribution Transformers	3
26 24 13	Switchboards	14
26 24 16	Panelboards	4
26 27 26	Wiring Devices	4
26 27 27	Wiring Device Plates	1
26 28 16	Enclosed Switches	2
26 29 13	Motor Starters	2
26 41 13	Lightning Protection Systems	4
26 43 13	Transient Voltage Surge Suppression	4
26 51 13	Interior Lighting Fixtures, Lamps and Ballasts	13
26 56 00	Exterior Lighting	2

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 05 00	Common Work Results for Electronic Safety and Security		5
28 30 00	Fire Detection and Alarm System		13

DIVISION 31 – EARTHWORK

31 11 00	Clearing & Grubbing		3
31 11 10	Demolition		2
31 23 00.13	Foundation Excavation and Backfilling	*[EMC section]*	6
31 23 13	Subgrade Preparation		5
31 23 23	Backfilling & Finish Grading		5
31 23 33	Trenching & Backfilling		5
31 31 16	Termite Control	*[MN section]*	3
31 37 00	Riprap		2
31 71 15	Proof Rolling		2

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 11 23	Base Course for Pavement		3
32 12 16	Asphaltic Concrete Pavement		3
32 13 13	Site Concrete Work		9
32 16 13	Concrete Curbs & Sidewalks		5
32 17 23	Pavement Marking		1
32 18 13	Synthetic Grass Surfacing	*[HFR section]*	10
Drawing	*T 1.0*	*Field Layout Graphics*	
Drawing	*T 1.1*	*Field Dimensions*	
32 92 19	Lawn & Grass Landscaping		4
32 93 00	Trees, Plants & Groundcover		15

DIVISION 33 – UTILITIES

33 11 10	Water Utility Distribution Piping		4
33 13 00	Disinfection of Water Distribution System		3
33 30 00	Sanitary Sewage Systems		5
33 40 00	Storm Drainage Systems		5

END OF TABLE OF CONTENTS

INDEX OF DRAWINGS

SHEET NO.:	DESCRIPTION	
GENERAL		
X 1.0	TITLE SHEET	
X 1.1	INDEX SHEET	
CIVIL & LANDSCAPING		
C 1.0	SITE SURVEY	
C 2.0	EROSION & SEDIMENT CONTROL PLAN	
C 2.1	EROSION & SEDIMENT CONTROL DETAILS	
C 3.0	DEMOLITION PLAN	
C 4.0	SITE LAYOUT PLAN	
C 5.0	GRADING & DRAINAGE PLAN	
C 6.0	SITE UTILITY PLAN	
C 6.1	PUBLIC WATER IMPROVEMENT PLAN	
C 7.0	SITE DETAILS	
C 7.1	SITE DETAILS	
L 1.0	LANDSCAPE PLAN	
SYNTHETIC ATHLETIC FIELD SURFACING		
T 1.0	FIELD LAYOUT GRAPHICS	*[in project manual]*
T 1.1	FIELD DIMENSIONS	*[in project manual]*
T 1.2	FIELD LAYOUT PLAN	
ARCHITECTURAL		
A 0.1	ARCHITECTURAL SITE PLAN	
A 1.0	FLOOR PLAN	
A 1.0A	FLOOR PLAN	***[Alternate No. 1]***
A 1.1	ROOF PLAN	
A 2.0	REFLECTED CEILING PLAN	
A 3.0	EXTERIOR ELEVATIONS	
A 4.0	BUILDING SECTION	
A 5.0	WALL SECTIONS	
A 5.1	WALL SECTIONS	
A 5.2	WALL SECTION DETAILS	
A 6.0	ENLARGED PLANS & INTERIOR ELEVATIONS	
A 7.0	SCHEDULES & DETAILS	
STRUCTURAL		
S 1.1	FOUNDATION PLAN	
S 1.2	ROOF / CEILING FRAMING PLAN	
S 2.1	SECTIONS & DETAILS	
S 2.2	SECTIONS & DETAILS	
S 3.1	GENERAL NOTES	
S 3.2	QUALITY ASSURANCE PLAN	

INDEX OF DRAWINGS

MECHANICAL

M 0.1	HVAC INDEX, LEGEND & SCHEDULES
M 1.0	HVAC PLAN
M 2.0	HVAC ENLARGED PLANS
M 4.1	HVAC DETAILS
M 7.1	HVAC CONTROLS
M 7.2	HVAC CONTROLS
M 7.3	HVAC CONTROLS

PLUMBING & FIRE PROTECTION

P 0.1	PLUMBING LEGENDS, SCHEDULES & NOTES
P 1.0	PLUMBING FLOOR PLAN
P 2.0	PLUMBING ENLARGED FLOOR PLANS
P 3.0	PLUMBING DETAILS
FP 0.1	FIRE PROTECTION LEGENDS, SCHEDULES & NOTES
FP 1.0	FIRE PROTECTION SITE PLAN
FP 2.0	FIRE PROTECTION FLOOR PLAN
FP 3.0	FIRE PROTECTION DETAILS

ELECTRICAL

E 0.1	ELECTRICAL LEGEND, INDEX & SCHEDULES
EL 1.0	LIGHTING FLOOR PLAN
EP 1.0	POWER FLOOR PLAN
ES 1.0	SYSTEMS FLOOR PLAN
E 4.1	ELECTRICAL DETAILS
E 4.2	ELECTRICAL DETAILS
E 5.1	ELECTRICAL DIAGRAMS

END OF INDEX

INVITATION TO BID

PROJECT:

Tennessee State University
Football Practice Facility
SBC Project No. 166/001-03-2007

DESIGNER:

Moody•Nolan, Inc.
1625 Broadway, 4th Floor
Nashville, Tennessee 37203
Tel. 615-386-9690 Fax 615-386-0528 Contact: Brian Tibbs

BRIEF PROJECT DESCRIPTION:

Construction of a wide span pre-engineered metal building practice facility with engineered field turf and an attached lean-to pre-engineered metal building administrative building; with site renovations and new site utilities.

Bids are invited for a General Contract for the Work of the above project.

Bids will be received by the State of Tennessee at

Tennessee Board of Regents (Central Office)
Office of Facilities Development
Suite 664 (6th Floor, southwest) Genesco Office Park
1415 Murfreesboro Road
Nashville, Tennessee 37217-2833

until

2:00 pm local time Wednesday January 13, 2010

at which time and place bids will be publicly opened. Bids sent by mail should be directed to the attention of

Rilla Froggett

Bidding documents may be examined at the Designer's office and at the following Plan Rooms:

F. W. Dodge Plan Room, Nashville, TN
Nashville Contractors' Association, Nashville, TN
Minority Business Development Center, Nashville, TN

Bidding Documents may be obtained from the Designer in accordance with the Instructions to Bidders upon the Designer's receipt of a certified or cashier's check payable to STATE OF TENNESSEE, payable in U.S. Dollars drawn on a U.S. bank, in the amount per set of **$ 150.00**

Bidders submitting bids equal to or greater than $25,000 in value are required to be licensed in accordance with state law. A statement of public contract crime status is required in the Bid form. A five percent (5%) Bid Security is required. Prevailing Wage law applies to any contract equal to or greater than $50,000 in value, or which has been determined to require Highway rates. Non-Discrimination policy applies to this project.

The Owner reserves the right to waive informalities and to reject bids.

INSTRUCTIONS TO BIDDERS

BIDDING DOCUMENTS

1.1 Bonafide prime Bidders and major subcontractors may obtain one Bid Pack, including Bidding Documents, Bid Envelope, and Bid Form, in accordance with provisions of the Invitation to Bid.

1.2 Individuals or firms securing Bid Packs become Bidders of Record, are automatically issued subsequent addenda, and will have deposit refunded upon returning complete Bidding Documents unmarked and in good condition within 15 days after the scheduled opening of bids. Bidders of Record who do not submit a bid are also required to return the unused Bid Envelope. Upon failure to meet these conditions, deposit shall be forfeited.

1.3 Bidders of Record may obtain additional copies of Bidding Documents at cost from Designer, but costs will not be refundable.

EXAMINATION

2.1 Bidders shall carefully examine site and documents to obtain first-hand knowledge of existing conditions and Work proposed. Copies of standards referenced in Project Manual are available for review through Designer's office.

2.2 Contractor will not be given extra payment for conditions which can be determined by examining site and documents.

QUESTIONS

3.1 Bidders shall submit questions about bidding documents to Designer in writing. Replies will be issued to Bidders of Record by addenda and will become part of Contract Documents. Designer and Owner will not make oral clarifications.

3.2 Questions must be received by Designer at least six calendar days before bid opening date.

3.3 No addenda will be issued less than three calendar days before bid opening date.

SUBSTITUTIONS

4.1 Substitutions before receipt of bids shall be as identified in Supplementary Conditions and Division 1 specifications. To request pre-bid approval of substitution, data required by Designer for evaluation must be received 10 calendar days before date set to receive bids. Acceptable substitutions will be identified in addenda.

4.2 Bidders submitting bids in reliance upon a substitution when the substitution has not been approved prior to bidding do so at their own risk.

LIQUIDATED DAMAGES and TIME

5.1 Conditions for liquidated damages are established in Supplementary Conditions. Time for completion and amount of liquidated damages are identified in Bid Form.

QUALIFICATIONS of CONTRACTORS

6.1 Bidders shall be familiar with the Contractors Licensing Act of 1976, as currently amended, codified in Tennessee Code Annotated Sections (TCA §) 62-6-101, et seq. A contract will not be awarded that conflicts with state licensing law.

6.2 In compliance with TCA § 50-9-114(a), potential bidders are advised that the Owner does not operate a certified drug-free workplace program providing for testing.

6.3 Bids submitted for this project shall not include a contractor or subcontractor that has been disqualified from participating in State construction projects under the supervision of the State Building Commission. As a matter of public record, the State Architect maintains a list of those that have been disqualified, and the Owner endeavors to include a current copy of that list in Bidding Requirements for its projects as Information Available to Bidders. Failure to include a current list shall not negate the effect of disqualification.

PRE-BID CONFERENCE

7.1 Pre-Bid Conference may be held approximately 10 days prior to bid opening date at time and place to be announced. Bidders of Record will be notified in writing whether or not a pre-bid conference will be held.

BID FORM

8.1 Make bids on an unaltered bid form furnished by the Designer in Bid Pack and duplicated in Project Manual. Submit one Bid Form. Failure to completely fill out Bid Form may cause bid to be rejected.

8.2 If a Bidder chooses not to bid an Alternate, Unit Price, or Base Bid in a multiple Base Bid project, write "no bid" in the space. To indicate availability of an Add Alternate at no additional charge, write "no charge" in the space. Additional stipulations or qualifications on Bid Form may cause bid to be rejected.

8.3 Bid Form shall be signed by person or persons legally authorized to bind Bidder to contract.

BID SECURITY

9.1 Bid Security is required in the amount of five percent (5%) of total amount bid, including alternates, made payable to State of Tennessee.

9.2 Bid Bonds shall be issued by Surety company licensed to do business in Tennessee by Tennessee Department of Commerce and Insurance, and shall have certified and current Power-of-Attorney for Attorney-in-Fact attached.

9.3 Checks shall be certified or cashier's, payable in U.S. Dollars drawn on a U.S. bank.

9.4 Owner may retain Bid Security of bidders to whom award is being considered until either: 1) Contract has been executed; 2) specified time has elapsed so that bid is not binding; or, 3) bid has been rejected. If Bidder refuses to enter into Contract or fails to furnish all required attachments properly executed, the amount of bid security shall be forfeited to Owner as liquidated damages, not as penalty.

BID SUBMITTAL

10.1 Submit Bid Form, with required attachments, in Owner's Bid Envelope furnished by Designer in Bid Pack. Blank spaces on face of Envelope shall be filled in by Bidder, except blank provided for Designer's approval.

10.2 If work is required for Plumbing, HVAC or Electrical, list subcontractor(s) that will perform that work. If there is no work in a category, write "None Required" in space. If Bidder will perform that work with Bidder's own forces, so indicate. If acceptance of alternate or combination of alternates changes subcontractor, indicate change on bid envelope.

10.3 Provide state contractor license number, expiration date, and applicable classifications for bidder and listed subcontractors.

10.4 Bidders are solely responsible for ensuring that bids are received by the time and at the place identified for receipt of bids. A bid sent by mail shall be enclosed in an envelope clearly marked "Bid Envelope Enclosed". Bids received late will be returned unopened.

WITHDRAWAL and MODIFICATION PRIOR to CLOSE of BIDDING

11.1 Bids, once submitted, may be withdrawn or modified before the scheduled opening time only upon receipt of request signed by a person legally authorized to bind bidder to contract. If bid is withdrawn, it may not be resubmitted. Modifications to bid may be made as "add" or "deduct" only. Oral, telephonic or telegraphic withdrawal or modification will not be considered. After time and date designated for receipt of bids, bid may not be modified during time period stipulated in Bid Form.

RECEIPT and OPENING of BIDS

12.1 Bids will be received and opened at time and place identified in Invitation to Bid.

POST-BID WITHDRAWAL of BID from CONSIDERATION DUE to MISTAKE

13.1 Request to withdraw bid due to mistake must be in writing to the Owner, delivered in person or postmarked certified or registered mail not later than twenty-four hours after the time fixed for receipt and opening of bids. Request shall acknowledge that bidder refuses to enter into contract based on bid and intends to submit original work papers, documents, and materials used in preparation of the bid in like manner within five working days following date of bid opening.

13.2 Bidder making such request will be removed from consideration for award of contract; and, a duly appointed review panel shall consider whether forfeiture of Bid Security should be waived.

CONSIDERATION of BIDS

14.1 To be considered, Bids shall be made in accordance with these Instructions to Bidders. Failure to comply with these bidding requirements may cause bid to be rejected.

14.2 It is Owner's intent to award contract, or multiple contracts in the case of multiple base bids, based upon lowest evaluated responsive bid submitted by responsible bidder for base bid plus alternates (if any) taken in order up to, but not to exceed the Bid Target. When alternates are included in bidding, Bid Target will be announced at bid opening prior to opening bids. Alternates may be accepted or rejected at Owner's discretion, provided that final combination of base bid and accepted alternates does not change low bidder as established by above method.

14.3 In the event of tie bids, preference will be given to in-state bidder over out-of-state bidder; and, if a tie still exists, successful bidder will be determined by chance.

14.4 In the case of a multiple Base Bid, Owner may award a combined contract for the Work of more than one Base Bid if the same bidder is the successful low bidder on each.

14.5 The Owner reserves right to: reject Unit Prices proposed in a bid without invalidating other portions of bid; reject a bid which does not provide all required Unit Prices; waive informalities; and, reject any or all bids.

POST BID INFORMATION

15.1 Each Bidder shall be prepared, if requested by Owner or Designer, to present evidence, within ten days of the request, of experience, qualifications, and financial ability to carry out the terms of the contract.

AGREEMENT FORMS and BONDS

16.1 Agreement form will be the Standard Form of Agreement Between Owner and Contractor included in this Project Manual. The following information and provisions will be filled in prior to the presentation of the Agreement form to Contractor by Owner: 1) Contracting Agency, Contractor, Project, and Designer will be identified on page one; 2) A full enumeration of the Contract Documents which make up the Agreement will be provided in Article 1; 3) Provisions for Contract Time and Liquidated Damages will be incorporated in Article 2; 4) The Contract Sum and the basis upon which it is determined, and Unit Prices proposed as a part of the successful bid which are accepted by the Owner, will be stated in Article 3; and, 5) The signature page will provide for a single signature by the Contractor, and will provide for the several signatures on behalf of the Owner as required by law and policy.

16.2 Successful Bidder shall complete and provide an Authorization Agreement for Automatic Deposits on the ACH Credits Form included in this Project Manual.

16.3 If the Contract Sum exceeds $100,000, the successful Bidder shall provide Contract Bond in the amount of one-hundred percent (100%) of the Contract Sum, and a Three Year Roof Bond, if and as stipulated in the Bid Form. Bonds shall be provided in accordance with paragraph 11.5 of the Conditions of the Contract and paragraph 17.2 below on the Owner's standard bond forms included in this Project Manual.

EXECUTION and AWARD of CONTRACT

17.1 Presentation of Agreement form by Owner to Successful Bidder for signature does not constitute award of Contract. Contract shall not be considered awarded until Bidder has received a fully executed Agreement.

17.2 If a Bidder is presented the written Agreement form for signing, then that Bidder shall deliver to the identified Owner's representative, within five calendar days after presentation, the required number of counterparts of the signed Agreement Form, Contract Bond, Roof Bond (if required), certificates of insurance, ACH Credits Form, and substitute W-9 federal tax form.

17.3 For the purpose of computing time, the five days referred to in paragraph 17.2 commence the day after receipt of the agreement form by Bidder. Should the fifth day fall on an State holiday, weekend, or other day of Owner's closing, Bidder shall provide required documents as directed no later than the next working day; however, regardless of circumstances or causes for Bidder exceeding delivery time, Owner shall be entitled to either require forfeiture of bid security or to add for each day the Bidder exceeds the five day period a corresponding extra day in which to return a fully executed contract, which return will be considered effectuated by mailing Agreement to the Contractor within the required time plus any extensions provided herein.

17.4 Owner will fill in date of Agreement on all forms when last signature is affixed. Last signature will be by Owner.

MINORITY PARTICIPATION

18.1 It is the express desire of the State Building Commission to include an emphasis on diversity in its contractual relationships with contractors for the construction, demolition, or renovation of State projects under jurisdiction of the Commission. The Commission acknowledges that firms who demonstrate and embrace diversity within their programs and policies are assisting the State in achieving its goals in building a more reflective marketplace of the community within this state. The State will require the successful bidder to report to the State the names and amounts of contracts entered into with minority-owned businesses on State projects in order for the State to collect data on such participation, as set forth in the Conditions of the Contract.

END of INSTRUCTIONS to BIDDERS

BID FORM

TO: **STATE OF TENNESSEE**
for the **PROJECT:** Tennessee State University
Football Practice Facility
SBC Project No. 166/001-03-2007

A. The Bidder hereby acknowledges, attests, certifies, warrants, and assures that:

1. Bidder has received, read, and understands the Bidding Documents, has visited the site and become familiar with local conditions under which work is to be performed, has correlated observations with requirements of Bidding Documents, and makes this bid in accordance therewith. Procurement Requirements documents numbered 00 30 00 through 00 39 99 provide Available Information that was prepared solely for Designer's use in design of this Work and have not been relied upon in the preparation of this bid. The use and interpretation of such information for any purposes is entirely the responsibility of the using party.

2. Contractors and subcontractors that have been disqualified from participating in State Building Commission projects have not been included in this bid, and will not be allowed to perform work under the contract that may result; and, Bidder shall not knowingly utilize the services of an illegal immigrant in the performance of this Contract and shall not knowingly utilize the services of any subcontractor or consultant who will utilize the services of an illegal immigrant in the performance of this Contract.

3. Failure to complete Bid Form, provide required attachments, or comply otherwise with the Instructions to Bidders, may be cause for rejection of bid; the person who signs this bid on behalf of the Bidder is required to be legally empowered to bind the Bidder to a Contract; and, the required Bid Security, in the amount of five percent (5%) of the total amount bid, is attached hereto.

4. The following statement is (check the one that is applicable)

☐ True
☐ False

The Bidder and/or any of the Bidder's employees, agents, independent contractors and/or proposed subcontractors have been convicted of, pled guilty to, or pled nolo contendere to any contract crime involving a public contract.

5. This Bidder has received the following addenda:

Addendum No _____ dated _____
Addendum No _____ dated _____
Addendum No _____ dated _____

B. This Bidder agrees to:

1. Honor this bid for a period of forty five (45) days following the date of the scheduled opening of bids.

2. Enter into and execute a contract, if presented on the basis of this bid, and furnish certificate(s) of insurance and other documents related to the contract as required, including, if the Contract Sum exceeds one-hundred-thousand dollars ($100,000), the Contract Bond and the Three Year Roof Bond, the latter in the amount of **$290,000.00**

3. Accomplish the Work in accordance with the Contract Documents.

4. Achieve Substantial Completion of the Work **180** calendar days from and including the date stipulated in the Notice to Proceed.

5. Accept the conditions for Liquidated Damages in the amount of **250** per calendar day.

BASE BID:

This Bidder agrees to complete the Work of the Base Bid for this project for the lump sum of (show amount in both words and figures):

_____and_____/100ths Dollars

$_____

ALTERNATES:

No. 1	Administration Offices Interior Finish-out	ADD	$_____
No. 2	Landscaping (non-essential as indicated)	ADD	$_____
No. 3	EMC hook up to campus system	ADD	$_____

Submitted by:

Authorized signature: _____ Date: _____

Name and title:
(Type or print) _____

On behalf of:
(Name of Bidder) _____

Bidder's address:
(Please give Street and Mailing address if different) _____

Bidder's Telephone Number: _____ Bidder's Fax Number: _____

Bidder's contact's email address: _____

Agreement

Between Owner and Contractor

where the Basis of Payment is a
STIPULATED SUM

Use only with the coordinated documents identified in the current
Designers' Manual
for projects of the State Building Commission of Tennessee and the Tennessee Board of Regents

AGREEMENT

made as of the day of in the year of

BETWEEN the Owner: **STATE OF TENNESSEE**
via the Contracting Agency: **Tennessee Board of Regents**

and the Contractor:

the Project:

the Designer:

The Owner and the Contractor agree as set forth below.

ARTICLE 1
THE WORK AND THE CONTRACT DOCUMENTS

1.1 The Contractor shall perform all the Work required by the Contract Documents for the Project identified on page one.

1.2 The Contract Documents are identified in the Conditions of the Contract (General, Supplementary, and other Conditions). These form the Contract and constitute the entire agreement between the Owner and the Contractor, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. An enumeration of the Contract Documents appears in paragraph 1.4.

1.3 Terms used in this Agreement which are defined in the Conditions of the Contract shall have the meanings designated in those Conditions.

1.4 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated as follows:

ARTICLE 2
TIME OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

2.1 The Work to be performed under this Contract shall be commenced on the date stipulated in the Notice to Proceed;
and, subject to authorized adjustments, Substantial Completion shall be achieved

2.2 Liquidated Damages, as set forth in paragraph 9.12 of the Supplementary Conditions, are

ARTICLE 3
CONTRACT SUM

3.1 The Owner shall pay the Contractor in current funds for the performance of the Work, subject to additions and deductions by Change Order as provided in the Contract Documents, the Contract Sum of

3.2 The Contract Sum is determined as follows:

3.3 The following Unit Prices will be used as specified:

This Agreement entered into as of the day and year first written above as witnessed:

BY CONTRACTOR:

Signature: _____

Name: _____

Title: _____

AND BY OWNER: STATE OF TENNESSEE
Tennessee Board of Regents

APPROVED: _____

APPROVED: _____

APPROVED: _____

BY: _____

END of AGREEMENT FORM for the Project titled:

ACH CREDITS FORM

Automated Clearing House Credits (not wire transfers)

Authorization Agreement for Automatic Deposits

Name: _____

Federal Identification Number or Social Security Number under which you are doing business with the State: _____

I/we hereby authorize the State of Tennessee, hereinafter called the STATE, to initiate credit entries to my/our

select type of account ☐ Checking or ☐ Savings

account indicated below and the depository named below, hereinafter called DEPOSITORY, to credit the same to such account. This authority to remain in full force and effect until the STATE has received notification from me (or either of us) of its termination in such time and in such manner as to afford the STATE and DEPOSITORY a reasonable opportunity to act on it.

Do you currently receive payments from the State through ACH? ☐ Yes ☐ No

If yes, do you intend for this account information to replace other existing account information currently used by the State? ☐ Yes ☐ No

If yes, please specify the account that should be changed:

ABA Number: _____ *Account Number:* _____

Is this authorization only for certain types of payments? ☐ Yes ☐ No

If yes, please indicate types:

_____

_____

Many banking institutions use different numbers for ACH.
Please call your bank for verification of ACH transit and account number.

Bank official contacted: _____ Phone number: _____

Depository / Bank:

Name: _____ Branch: _____

City: _____ State: _____

Transit/ABA No. _____ Account No.: _____

please print name(s) of authorized account signatory

Name(s) _____

Date _____ Signed: _____ Signed: _____

Please attach a deposit slip (or for checking accounts, a voided check).

Please indicate address to which you would like your remittance advisories routed when payments are processed:

For State use only: Contact Agency: _____

Contact Person: _____

Telephone No.: _____

SUBSTITUTE W-9 FORM

Request for Taxpayer identification number and certification

1. Please complete general information:

Name: _____ Phone Number: _____

Business Name *(if applicable)*: _____

Address: _____

City: _____ State: _____ Zip Code: _____

2. Circle the most appropriate category below: *(Please circle only one)*

1) Individual (not an actual business)

2) Joint account (two or more individuals)

3) Custodian account of a minor

4) **a)** Revocable savings trust (grantor is also trustee)

b) So-called trust account that is not a legal or valid trust under state law

5) Sole proprietorship (using a social security number for the taxpayer ID)

6) Sole proprietorship (using a federal employer identification number for taxpayer ID)

7) A valid trust, estate, or pension trust

8) Corporation

9) Association, club, religious, charitable, educational, or other non-profit organization (for entities that are exempt from federal tax, use category 13 below)

10) Partnership

11) A broker or registered nominee

12) Account with the Department of Agriculture in the name of a public entity that receives agricultural program payments

13) Government agencies and organizations that are tax-exempt under Internal revenue Service guidelines (i.e., IRC 501(c)3 entities)

3. Fill in your taxpayer identification number below: *(Please complete only one)*

1) If you circled number 1 - 5 above, fill in your Social Security Number.

____ ____ ____ - ____ ____ - ____ ____ ____ ____

2) If you circled number 6 - 13 above, fill in your Federal Employee Identification Number (EIN).

____ ____ - ____ ____ ____ ____ ____ ____ ____

4) Sign and date the form:

Certification - Under penalties of perjury, I certify that the number shown on this form is my correct taxpayer identification number. If I circled category 13 above, I also certify that my agency or organization is tax-exempt per Internal revenue Service guidelines and not subject to backup withholding.

Signature: _____ Date: _____

Title *(if applicable)*: _____

CONTRACT BOND

standard form for construction contracts under the State Building Commission of Tennessee

BOND NO. _____

Know all men by these presents: that we

(hereinafter called the "Principal") and

hereinafter called the "Surety") do hereby acknowledge ourselves indebted and securely bound and held unto

(hereinafter called the "Owner"), and in the penal sum of

good and lawful money of the United States of America, for the use and benefit of those entitled thereto, for the payment of which, well and truly to be made, we bind ourselves, our heirs, our administrators, executors, successors, and assigns, jointly and severally, firmly by these presents.

But the condition of the foregoing obligation or bond is this:

Whereas, the Owner has engaged the principal for the sum of

to complete the Work of the project titled:

as more fully appears in a written agreement or contract bearing the date of

a copy of which said agreement or contract is by reference hereby made a part hereof, as fully and to the same extent as if copied at length herein, and it is the desire of the Owner that the Principal shall assure all undertakings under said agreement or contract and shall assure and protect all laborers and furnishers of material on said Work both as provided by Tennessee Code Annotated Sections 4-15-102(f)(2) and 12-4-201 through 12-4-206, and any and all amendments thereto, and shall assure the prompt payment of claims as provided by Tennessee Code Annotated Sections 12-4-207 through 12-4-208, and any and all amendments thereto. The Principal shall also comply with provisions of Tennessee Code Annotated Sections 12-4-401 through 12-4-415, and any and all amendments thereto, pertaining to the payment of the prevailing wage rate.

Now, therefore, if the Principal shall fully and faithfully perform all undertakings and obligations under the contract hereinbefore referred to and shall fully indemnify and hold harmless the Owner from all costs and damage whatsoever which it may suffer by reason of any failure on the part of the Principal to do so, and shall fully reimburse and repay the Owner any and all outlay and expense which it may incur in making good any such default, and shall fully pay for all of the labor, material and work used by the Principal and any immediate or remote sub-contractor or furnisher of material under him in the performance of said contract, in lawful money of the United States, as the same shall become due, then this obligation or bond shall be null and void, otherwise to remain in full force and effect.

And for value received, it is hereby stipulated and agreed that no change, extension of time, alteration or addition to the terms of the contract or to the Work to be performed thereunder or to the specifications accompanying the same shall in any wise affect the obligation under this bond, and notice is hereby waived of any such change, extension of time, alteration or addition to the terms of the contract or to the Work or to the specifications.

In witness whereof the Principal has hereunto affixed its signature and Surety has hereunto caused to be affixed its corporate signature and seal, by its duly authorized officers, on this _____ day of _____, 20___.

Executed in _____ counterparts.

Witness:

_____	_____
(name of Principal)	*(name of Surety)*
_____	_____
(authorized signature)	*(signature of Attorney-in-fact)*
_____	_____
(name of signatory)	*(name of Attorney-in-fact)*
_____	_____
(title of signatory)	*(Tennessee license number of Agent or Attorney-in-fact)*
	_____
	(countersignature of resident Agent if not same as Attorney-in-fact)

Surety Company issuing bond shall be licensed to transact business in State of Tennessee by Tennessee Department of Commerce and Insurance. Bonds shall have certified and current Power-of-Attorney for the Surety's Attorney-in-Fact attached. Attorney-in-fact who executes bond on behalf of Surety shall be licensed by and a resident of State of Tennessee, and shall affix license number to bond; or, countersignature by a licensed agent who is a resident of State of Tennessee, and the agent's license number, shall be affixed to the bond in addition to the signature of the Attorney-in-Fact.

Compliance with State of Tennessee Laws Requiring Payment of

Prevailing Wage Rates

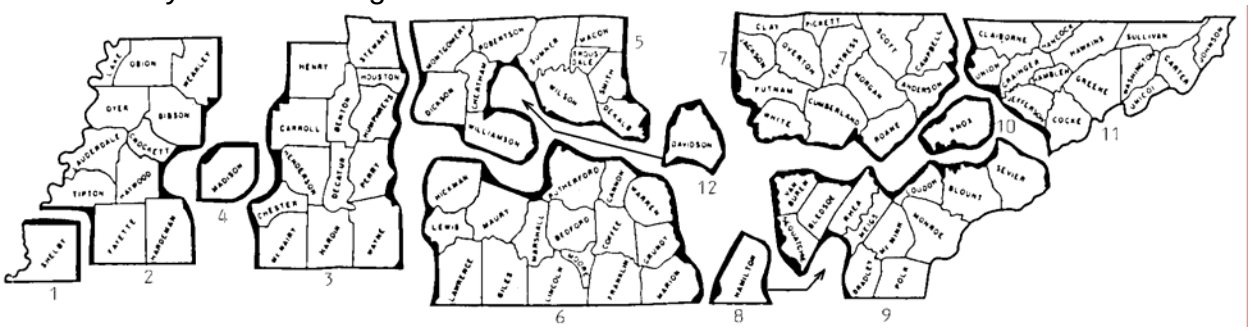
A. Refer also to the other Conditions of the Contract, particularly:

1. For projects using OFD General Conditions for General Work, which is a modified version of AIA document A201, subparagraph 3.4.6.

2. For projects using OFD General Conditions for Minor Work, subparagraph 3.4.4.

B. Establishment of Rates:

1. TCA § 12-4-401, et seq, mandates minimum rates to be paid to the workers on State construction projects. Pursuant to that law, a Wage Rate Determination is included in the bidding and contract documents, following this document, and includes a form identifying a Decision Number followed by a list or lists of rates for building construction and/or highway construction, as determined applicable by the Department of Labor and Workforce Development (DoL&WD) and indicated in the Determination. Highway rates are state-wide, but Building Rates are issued for 12 regions. The map below is believed to accurately reflect the regions.



2. Depending on the Work, multiple rates may apply, and multiple lists may be required. Anyone using a rate list should beware of the remote possibility of a clerical error in the issuance.

C. To determine the rates required to be paid laborers and mechanics on the project:

1. Refer to the Wage Rate Determination(s) to see whether Building Rates, Highway Rates, or both apply.

2. For Work that requires Building Rates in more than one county, if the counties are in more than one of the 12 Building Rate Regions, there is normally a separate Determination for each Region, and a separate list of rates for each region. Each regional list of building rates normally has the Region identified at the bottom of the page, and applies to Work performed in that Region. Occasionally, a table of rates for all 12 regions is included.

3. Highway Wage Rates, when applicable, apply state-wide in all locations.

4. Further details about Prevailing Wage regions, regulations, and descriptions of the craft classifications can be obtained from the DoL&WD Division of Labor Standards, including but not limited to their website: http://www.state.tn.us/labor-wfd/prevail.html

5. If federal wage rates are also required, the required documents pertaining thereto are to be included here following the list(s) of State rates. In such cases, and when workers are employed for work listed in both rate schedules, the workers are to be paid the higher of the scheduled rates.

D. To report the rates paid laborers and mechanics on the project:

1. Refer to the Wage Rate Determination(s) for identification and address of Inspector.
2. If there is more than one Determination, prepare a separate report for the portion of Work each covers.
3. Include Decision Number on report.
4. Send report to the Inspector listed in the box headed “Report to”.

E. Claims by the State for non-compliance.

1. If the DoL&WD suspects that a worker is not being paid in accordance with the Prevailing Wage Rates, the DoL&WD may make an estimate of the possible wage liability and bring that to the attention of the Owner.

2. The Owner may treat the DoL&WD estimate of wage liability as a claim.

END of document.

Combined Request and Decision form for

Wage Determination

Request made by	
Name of person	Trish Whitlock
Title	Project Manager
Department, Agency, or Bureau	Tennessee Board of Regents Office of Facilities Development
Address and phone	Suite 664 1415 Murfreesboro Road Nashville, Tennessee 37217-2833 Fax: (615) 366-3992

Date of request	Date of Advertisement	Supercedes Decision
11/12/2009	12/02/2009	

If Work is in multiple building rate regions, a separate request is required for each region; and, if in multiple counties within a region, all counties must be listed.

The Project		
City	**State**	**County**
Nashville	TN	Davidson

Project Identification

SBC Project No. 166/001-03-2007
Football Practice Facility
Tennessee State University
Nashville, TN

Brief Project Description

Construct a 225' x 270' pre-engineered building for indoor practice and football meeting/operations facilities with a 225' x 30' build out.

Decision rendered by
State of Tennessee Dept. of Labor and Workforce Development Labor Standards Division 220 French Landing Drive Nashville, Tennessee 37243-1002

Wage Determination

Decision Number **T-32901**

Building Rates	[X]	Apply
	[ ]	Do not apply
Highway Rates	[ ]	Apply
	[X]	Do not apply

Report to

INSPECTOR THOMAS HAMLETT
DEPT. OF LABOR & WORKFORCE DEV.
DIVISION OF LABOR STANDARDS
220 FRENCH LANDING DRIVE
NASHVILLE, TN. 37243-1002

Date assigned	Assigned by
11/12/2009	Michael Dattilo

The project identification and brief project description given herein shall not act to define, expand, or limit the Work required by the Contract Documents. Such information provided herein is intended only as information to the Department of Labor and Workforce Development. No other use or interpretation is intended.

CLASSIFICATION	CLASSIFICATION	REGIONS	1	2	3	4	5	6	7	8	9	10	11	12
Boilermaker	Constructor de Calderas	01	21.22	16.82	18.13	15.53	16.27	15.15	20.23	20.86	18.98	19.25	13.57	16.05
Bricklayer	Ladrillero	02	18.78	23.16	18.57	15.44	25.03	24.85	18.49	23.69	20.27	17.39	11.97	20.00
Carpenter	Carpintero	03	20.31	15.76	19.51	18.86	16.65	18.29	21.95	20.52	18.12	17.80	14.14	17.21
Cement Finisher, Plaster	Terminador de Cemento	04	17.25	13.99	15.15	14.17	13.32	14.81	21.68	18.09	16.36	17.58	14.04	16.45
Class "A" Operator	Operador Clase "A"	05	20.42	17.87	19.99	16.39	16.45	18.65	22.64	17.24	14.35	18.78	14.18	16.60
Class "B" Operator	Operador Clase "B"	06	13.50	12.53	14.55	12.62	10.87	11.84	13.99	14.43	11.60	11.23	8.52	11.73
Class "C" Operator	Operador Clase "C"	07	15.88	18.50	13.30	12.82	12.52	12.44	15.06	17.08	10.30	15.77	10.97	12.26
Electrician	Electricista	08	22.06	22.03	18.20	18.83	21.01	22.45	23.24	25.93	20.35	21.56	17.56	21.81
Low Voltage Electrician <70 Volts	Electricista De Bajo Voltaje <70 Volts	09	20.30	16.64	16.64	16.64	15.50	17.28	16.64	16.64	16.64	16.31	16.64	17.23
Elevator Constructor	Constructor de Elevadores	10	20.32	15.96	17.71	14.72	24.81	24.65	18.36	20.39	18.52	19.14	19.04	25.18
Glazier	Vidriero/Rebanadador	11	20.12	18.17	14.65	12.19	18.22	17.45	16.90	16.23	15.89	16.07	16.09	17.39
Insulation Worker for Mechanical Trades / Asbestos Worker	Trabajador de Insulacion para Entramador de Mecanico/ Trabajadora De Asbesto	12	21.87	22.99	23.01	19.31	17.49	18.44	20.25	20.99	19.92	14.02	13.40	18.01
Iron Worker: Structural, Reinforcing, Ornamental	Herrero	13	21.03	17.09	14.14	19.30	16.26	21.13	21.42	21.20	16.93	15.24	13.80	19.46
Laborer Class A	Obrero Clase A	14	13.12	12.29	11.97	11.91	16.83	12.27	13.38	12.46	11.67	13.94	10.28	12.41
Laborer Class B	Obrero Clase B	15	12.90	9.79	15.80	11.24	11.76	11.78	14.49	10.86	11.15	11.43	9.22	12.50
Millwright	Tornero	16	18.14	14.05	16.71	14.28	15.62	20.76	18.94	19.16	15.89	15.19	23.60	19.80
Painter/Plasterer	Pintor/Yesero	17	17.53	17.85	20.22	12.32	14.15	12.87	19.53	17.07	12.86	15.32	14.26	15.09
Pipefitter/Plumber	Instalador de Tuberia/Plomero	18	25.22	22.55	22.47	21.58	20.25	26.52	24.48	20.99	15.06	17.50	15.70	25.97
Roofer	Tejero/Instalador de Techos	19	19.59	13.37	15.45	11.54	13.54	13.13	17.26	20.60	14.57	16.83	14.02	20.43
Sheet-Metal Worker	Hojalatero	20	26.50	22.29	23.81	15.57	19.98	22.68	23.80	19.61	15.76	19.03	17.86	21.97
Truck Driver (3 or more axles)	Camionero (3 o más ejes)	21	15.13	10.62	11.96	10.26	12.85	12.44	17.48	17.71	9.70	10.83	11.15	16.21
Truck Driver (2 axles, over 1 ton)	Camionero (2 ejes,más de 1 tonelada)	22	16.00	8.48	9.41	10.80	13.55	9.40	11.01	14.19	10.01	12.05	11.42	17.93
Truck Driver (2 axles, 1 ton & less)	Camionero (2 ejes,menos de 1 tonelada)	23	15.37	9.26	10.27	10.93	10.60	8.33	17.41	13.91	9.41	10.61	13.73	10.63

APPRENTICESHIP REGULATIONS

Under T.C.A., §12-4-415, the Prevailing Wage Commission has promulgated Rule 0800-3-2-.01(1) which provides that: "Apprentices shall mean those persons registered individually under a bona fide apprenticeship program registered with the Bureau of Apprenticeship and Training in the United States Department of Labor. The state agency contracting officer shall require the contractor or sub-contractor using the apprentice to submit evidence of his indenture and/or apprenticeship registration when the apprentice's name first appears on a submitting payroll."

AUTHORITY: T.C.A. §12-4-415. **Administrative History:** Original Rule filed June 4, 1976. Effective: July 14, 1976.

The Tennessee Department of Labor and Workforce Development is an equal opportunity employer. Auxiliary aids and services are available upon request to individuals with disabilities.
TTY: 615-532-2870; 1-800-848-0299; TTY/TDD 711.

Tennessee Department of Labor and Workforce Development, Authorization No. 337462. 600 copies. 02/07 This document has been promulgated at a cost of $.02 per copy.

REGION 1
Shelby

REGION 2
Crockett
Dyer
Fayette
Gibson
Hardeman
Haywood
Lake
Lauderdale
Obion
Tipton
Weakley

REGION 3
Benton
Carroll
Chester
Decatur
Hardin
Henderson
Henry
Houston
Humphreys
McNairy
Perry
Stewart
Wayne

REGION 4
Madison

REGION 5
Cheatham
Dekalb
Dickson
Macon
Montgomery
Robertson
Smith
Sumner
Trousdale
Williamson
Wilson

REGION 6
Bedford
Cannon
Coffee
Franklin
Giles
Grundy
Hickman
Lawrence
Lewis
Lincoln
Marion
Marshall
Maury
Moore
Rutherford
Warren

REGION 7
Anderson
Campbell
Clay
Cumberland
Fentress
Jackson
Morgan
Overton
Pickett
Putnam
Roane
Scott
White

REGION 8
Hamilton

REGION 9
Bledsoe
Blount
Bradley
Loudon
McMinn
Meigs
Monroe
Polk
Rhea
Sequatchie
Sevier
Van Buren

REGION 10
Knox

REGION 11
Carter
Claiborne
Cocke
Grainger
Greene
Hamblen
Hancock
Hawkins
Jefferson
Johnson
Sullivan
Unicoi
Union
Washington

REGION 12
Davidson

SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.01 GENERAL PROJECT DESCRIPTION

A. Project Description: This project consists of the construction of a wide span pre-engineered metal building (indoor practice facility) with engineered field turf and an attached lean-to pre-engineered metal building (administrative wing), totaling 63,260 GSF; with site renovations and new site utilities, for Tennessee State University. The project is located at 3500 John Merritt Boulevard, Nashville, TN 37209, as indicated on Project Documents prepared by Moody Nolan, Inc. 1625 Broadway, Suite 400, Nashville, TN 37203.

B. Project is to be constructed under a single prime contract.

C. A subsurface geotechnical investigation has been performed per Section 00 31 32. All other testing and inspections shall be performed by testing firms hired by and paid for by the Contractor, as approved by the Architect. See the various specification sections for testing requirements.

1.02 DESCRIPTION OF WORK

A. The following is a brief description of work under Contract for this project. Refer to the drawing package and project manual for total scope of work:

1. Selected site demolition and removal / disposal of all materials including excavated materials determined to be unsuitable for backfill, fill or grading by the Geotechnical Engineer.
2. Site clearing, grading, landscaping and paving; and erosion control.
3. Subsurface utility installations and utility services along with complete storm drainage and sanitary sewer systems.
4. Complete metal building system for combined long-span and lean-to engineered structure along with all related structural components.
5. Complete finish out of long span practice facility (55,320 GSF) including field turf, MPE systems, all service utilities and related site work.
6. Complete the building shell portion of the attached lean-to metal building system (7,940 GSF), with related structural components and site work. The interior finish-out portion of this wing (2,725 GSF) will only occur in the lobby, toilet, training and service rooms. The finish out of the remaining areas will be the scope of work in alternate #1 (see Section 01 23 00).
7. Coordination of new work with existing campus systems.

1.03 PROJECT SCHEDULE

A. Prepare a detailed construction procedure and schedule and submit it to the Architect for approval. Such procedure and schedule must be approved in writing by the Architect prior to the start of construction work. See General Conditions,

Article 14 and Section 01 32 15.

B. Completion of the work within the time frame allotted is critical to the project and the schedule will be strictly adhered to. Contractor shall be responsible for the expediting of the fabrication and delivery of materials and equipment and shall coordinate delivery of same with the approved construction schedule to allow for completion within the time period specified in the Form of Proposal.

1. It is recognized that the work can be unavoidably affected or influenced by governing regulations, natural phenomena including weather conditions and other forces outside the Contract Documents. However, every effort must be made to keep the project on schedule due to the firm deadline established by the Owner for this particular phase of the work.

1.04 MISCELLANEOUS PROVISIONS

A. Performance Requirements for Completed Work: Provide the final and completed project complete and ready for use in every respect by the completion date specified herein.

1. Contract Documents indicate the intended occupancy and utilization of the building and its individual systems and facilities. Compliance with all applicable governing regulations, codes and standards is intended and required for the work and for the Owner's occupancy and utilization.

2. In addition to the requirement that every element of the work comply with applicable requirements of the Contract Documents, it is also required that the work as a whole comply with all applicable industry standards and governing codes and regulations.

3. All Work, including means and methods, shall comply with the regulations and procedures established by the Tennessee Board of Regents (Owner).

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 - GENERAL

1.01 SECTION INCLUDES identification of each Alternate by number, and describes the basic changes to be incorporated into the Work if a particular alternate is made a part of the work by specific provisions in the Agreement between the Owner and the Contractor.

1.02 RELATED SECTIONS are referenced in the definition of each Alternate.

1.03 COORDINATION of related work and modifications to surrounding work as required to properly integrate each Alternate, and to provide the complete construction required by the Contract Documents, is the responsibility of the Contractor.

1.04 DESCRIPTION OF ALTERNATES:

Alternate No. 1 [Administration Offices]

Base Bid	Provide scope of work as indicated on Sheet A 1.0, including unfinished shell for the administration building.
Alternate	Provide complete interior finish-out of administration building, including MPE, as indicated on Sheet A 1.0 A.

Alternate No. 2 [Landscaping]

Base Bid	Provide landscaping as indicated on Sheet L.1.0.
Alternate	Provide non-essential trees and shrubbery as highlighted on landscape plan.

Alternate No. 3 [Emergency Management Control (EMC) Hook-up]

Base Bid	No connection to existing system.
Alternate	Provide connection to campus-wide system.

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SUPPORTING DOCUMENTATION for PROPOSALS or CLAIMS

A. Propose related changes to Work, Contract Sum, and Contract Time, in writing together. Propose unrelated changes separately. Attach and reference pertinent documents related to the change.

B. For a change in the Work, specifically describe proposed change, or briefly describe the proposed change with specific reference to a completely descriptive attachment, such as a Request for Proposal from the Designer.

C. For a change in Contract Sum, state briefly the reason for change, state the amount, and provide itemization of values on forms shown in Section 01 26 50, or similar forms providing the same information:

1. **Itemization Summary:** listing the itemizations of work by subcontractors and the Contractor that together apply to an entire related change in work.
2. **Itemization of Class 1 Time-Related Expenses:** if applicable, deriving an average cost per day.
3. **Itemization of Work:** detailing the quantities, units, costs, and extensions for materials, equipment, and labor, subtotaled, plus overhead, and profit related to a specific proposed change in the Work.

D. For a change in Contract Time:

1. Fully describe the extent of and reasons for the change and effect of the change on the construction schedule, and attach a revised Progress Schedule. Take into account weekends, holidays, and the specified standard baseline for weather delays during the period of the requested extension.
2. For a change based on weather-related delay, provide and attach:
   a. applicable specified Weather Delay Reports, or, if none is specified, daily work logs that describe actual local weather conditions and their impact on progress.
   b. National Oceanic and Atmospheric Administration (NOAA) weather data, for corroboration.
   c. NOAA comparative data on normals, means, and extremes if such data or another weather baseline is not already provided in Contract Documents.

1.02 SIGNATURES for Change Order:

A. Form shall be similar in format and content to Section 01 26 40, and signed by authorized representatives of each of the entities required by Conditions of the Contract.

B. Normal procedure shall be that:

1. Designer prepares and submits supporting documents to Owner.
2. Owner produces and signs six (6) counterparts of form; transmits by fax, e-mail, or other means, informational copies to its Construction Representative, Designer, and Contractor; and forwards.
3. Owner's Construction Representative receives counterparts, and brings them to next Progress Meeting, unless urgency and opportunity make for a more timely execution.
4. Designer and Contractor both sign at Progress Meeting.

END OF SECTION

SECTION 01 26 40
FORM FOR AMENDMENT, CHANGE ORDER, OR DIRECTIVE

[ ] Amendment

[ ] Change Order

[ ] Construction Change Directive

Modification Number:

PROJECT:

Original Contract Date:
This Change initiated:

Project Number

The following changes in the Contract are hereby directed:

Item	Reference	Work	Contract-Sum	Contract-Time

The original Contract Sum	**$**
Net Change previously authorized	**$**
The Contract Sum prior to this Modification	**$**
This modification (*increases* / *does not change* / *decreases*) the Contract Sum	**$**
The new Contract sum, including this modification	**$**
This modification (*increases* / *does not change* / *decreases*) the Contract Time	
The new Contract Time, including this modification	
The last day of the Contract Time, including this modification	

CONTRACTOR	DESIGNER	OWNER
Signed	Signed	Signed
Name & Date	Name & Date	Name & Date
For	For	For

SECTION 01 26 50
FORMS FOR ITEMIZATION

Rounding off values is permitted on State contracts if rounding up for decreases and rounding down for increases. Embedded math functions without rounding are included in an Excel™ version of this form that can be downloaded from the website
http://www.tbr.state.tn.us/facilities/construction/forms.htm

Form for Itemization Summary

SBC Project Number:	Project Name:

Name of General Contractor:

Proposal Number:	Date Itemized:	Page of pages

Work by subs & sub-subs	Name of subcontractor	Costs & Allowances

Subtotal:	
5% additional OH&P allowed:	

Subtotal for general Contractor for Work by subcontractors:

Work by general Contractor:	

Subtotal (including subcontractors and the general Contractor)**:**

Bond Premium: % =

Total:

Form for Itemization of Class 1 Time-Related Expenses

SBC Project Number:	Project Name:
Work itemized below provided by:	
Proposal Number:	Date Itemized:	Page of pages

Description	Period Cost	Period (Year, Month, Week, Day)	Cost Per Day
Superintendent Salary			
Superintendent Vehicle			
General Use Vehicles			
_ _ _ _ _ _ _ _ _ _ _ _			
_ _ _ _ _ _ _ _ _ _ _ _			
_ _ _ _ _ _ _ _ _ _ _ _			
Field Office			
Field Office Equipment			
Computer			
Fax machine			
Copier			
Typewriter			
Calculator			
Field Office Utilities			
Electricity			
Natural Gas			
Water Service			
Drinking Water			
Telephone Service			
On-Site Storage			
Shed			
Trailer			
Safety Program			
Cleaning			
Site Toilet(s)			
		Subtotal of Costs:	
		10% for Overhead:	
		Subtotal with Overhead:	
		5% for Profit:	
		Total per day:	

Form for Itemization of Work

SBC Project Number:	Project Name:

Work itemized below provided by:

Proposal Number:	Date Itemized:	Page of pages

Description	Material				Equipment				Labor			
	Quantity	Unit	Cost	Extension	Quantity	Unit	Cost	Extension	Quantity	Unit	Cost	Extension

Materials Subtotal			Labor Subtotal:	
	% Sales Tax =			% Mark-up =
Materials Total:		**Equipment Total:**	**Labor Total:**	

Subtotal of Costs of Materials + Equipment + Labor = $

10% Overhead allowed on costs = $

Subtotal of Costs + Overhead = $

5% Profit allowed on Costs + Overhead = $

Total for this change = $

SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Phases are normally set forth in the Agreement and in the Summary of Work specification, normally from 01 10 00 to 01 10 19, but may differ in this Project Manual.

B. Applications for Payment and the final statement of accounting are normally specified in sections from 01 29 00 to 01 29 99, such as OFD standard Section 01 29 76, but may differ in this Project Manual.

C. Allowances are normally specified in sections from 01 21 00 to 01 21 99, such as OFD standard sections 01 21 13 and 01 21 15. Allowances associated with Unit Prices are normally in sections from 01 22 00 to 01 22 99, such as OFD standard sections 01 22 13 and 01 22 15. The arrangement of sections may differ in this Project Manual.

1.02 FORM and APPROVAL

A. The form for schedule of values shall be AIA Document G703 Continuation Sheet.

B. If objected to by Designer, revise and resubmit to Designer's satisfaction prior to submitting application for payment. If during construction the total completed for payment purposes exceeds or is anticipated to exceed allocations, revise and resubmit a schedule of values such that no values of completed work exceed their allocations.

1.03 ALLOCATION OF VALUES

A. If the Work is divided into defined portions ("Phases"), intended to have distinct commencement, duration, or completion requirements, divide the allocation to correspond to the Phases, then within each Phase, subdivide the allocations as specified in the following paragraphs.

B. Provide at least these three line items to account for General Requirements:

1. Mobilization, staging, and general start-up costs.
2. Construction administration and temporary facilities, prorated over the course of the project.
3. Maintenance of Record Documents, prorated over the course of the project.

C. If sitework is included, other than minor sitework incidental to a building or major structure, include sitework in single line item or group of line items. Within the group, categorize site utilities, roads and parking, and appurtenances according to general type and physical separation. If allowances are stipulated in the Work relating to sitework, provide a line item for each such allowance, including quantity allowances associated with Unit Prices.

D. For each involved building or major structure:

1. If allowances are stipulated in the Work, provide a line item in the Schedule of Values for each allowance, including quantity allowances associated with Unit Prices.
2. Categorize by major trades or units of work corresponding to the current Progress Schedule, and relate to the Divisions and Sections of the Specifications.
3. Further subdivide as desired, but maintain a distinct and identifiable correspondence to this allocation.

E. Account for Modifications by incorporating them into the appropriate allocations, or with a line item for each, until incorporating each into the appropriate allocations for the final statement of accounting.

END OF SECTION

SECTION 01 29 76
APPLICATIONS AND CERTIFICATES FOR PAYMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS FOR ALL APPLICATIONS

A. FORM:

1. Use AIA Document G702 Application and Certificate for Payment.

2. Use AIA Document G703 Continuation Sheet itemized with the line items and values of the Schedule of Values accepted by the Designer, and values and percentages for each line item.

B. Materials suitably stored on-site but not yet incorporated into the Work may be claimed for payment; and, materials suitably stored off-site may be claimed for payment if documented in accordance with 1.02.B.6 below.

C. Calculation of Retainage and amounts withheld:

1. Credit for completed work and stored materials, and deductions for incomplete work, comprise the "Total Completed and Stored to Date". The "Total Completed and Stored to Date" shall not include the value of Punch List items that remain incomplete after Substantial Completion.

2. Retainage is calculated as a percentage of "Total Completed and Stored to Date": 5% prior to Substantial Completion; 2% after Substantial Completion; then, none at final payment.

3. Other amounts withheld (i.e., potential liquidated damages or in response to subcontractor claims of non-payment) are deducted from the resulting Current Payment Due.

D. SUBMITTAL:

1. Submit draft of each application by fax or otherwise to Designer and to the Owner's Construction Representative three (3) days prior to actual submittal. Submit each application to the Designer at Progress Meeting, Substantial Completion inspection meeting, final inspection meeting, or after the final inspection meeting.

2. Submit six (6) counterparts bearing original seals and signatures, each with required attachments and accompanying submittals, in accordance with other applicable articles of this Section.

1.02 Provide the following ATTACHMENTS AND ACCOMPANYING SUBMITTALS with each counterpart of each application for PROGRESS PAYMENTS

A. Stamped or embossed counterpart of Consent of Surety, if application makes a reduction in retainage.

B. Copy of:

1. Continuation sheets.

2. Visitor Log for the period covered by application.

3. Weather Delay Report for all calendar months completed and not previously submitted.

4. Progress Schedule, updated and current, indicating progress through the period covered by application and scheduled progress through completion of Work.

5. Shop Drawing Log for entire project through the period covered by application, if required.

6. For materials stored off-site:

a. Statement identifying where materials are stored, and assuring that materials are tagged to identify them for use in the project.

b. Bill(s) of sale for materials claimed that list(s) all items.

c. Certificate of insurance covering materials claimed, recognizing Owner's right to make claims.

1.03 APPLICATION FOR PAYMENT UPON SUBSTANTIAL COMPLETION

A. At the Substantial Completion inspection, submit application for payment, including appropriate reduction in retainage, with the following attachments:

1. Continuation sheets described in 1.01.A.2.
2. Stamped or embossed counterpart of Consent of Surety to Reduction in Retainage, using AIA Document G707A or a similarly formed letter.
3. Copy of the Use & Occupancy Permit (some jurisdictions have a different name for this document).
4. Copy of a document identifying to whom Contractor delivered the Operating and Maintenance Data Binders.
5. Documents required for materials stored off-site, if applicable, in accordance with 1.02.B.6.
6. Weather Delay Report for all calendar months completed and not previously submitted.

B. In order to reduce retainage below the amount corresponding to Substantial Completion, complete the prerequisites to Final Payment specified in the Section on Close-Out Procedures and below.

1.04 APPLICATION FOR FINAL PAYMENT

A. When requesting final inspection, submit a final application for payment with the following attachments:

1. Final Continuation sheets described in 1.01.A.2.
2. Counterpart of Contractor's Affidavit of Payment of Debts and Claims, using AIA Document G706.
3. Stamped or embossed counterpart of Consent of Surety Company to Final Payment, using AIA Document G707 or a similarly formed letter. If Contractor has listed exceptions in the G706 form, Surety's consent shall acknowledge such exceptions.
4. Certificate of insurance for products and completed operations to the effect of that required by 9.10.2(2) and 11.1.2.1.c of the Conditions of the Contract.
5. Written statement assuring of continued insurability to the effect of that required by 9.10.2(3) of the Conditions of the Contract.
6. Final acounting of the Contract Sum which appropriately allocates the entire Contract Sum to the Divisions of the Specifications. This may follow the same format as the Schedule of Values.
7. Copy of the Roof Warranty or warranties, if and as required on form exhibited as Section 01 78 36.
8. Copy of the Report of Subcontractors and Suppliers, on form exhibited as Section 01 78 88 or equal.
9. Copy of a document identifying to whom Contractor delivered the Project Data Binders.
10. Weather Delay Report for all calendar months completed and not previously submitted.

B. After the Designer has certified that the Work and needed modifications to the Contract are complete, and if instructed to do so by the Designer, submit a revised application.

1.05 CERTIFICATION

A. Designer, if in disagreement with the amounts claimed in an application, may either return application to Contractor for revision and resubmittal, or revise application by hand to indicate corrections Designer considers appropriate.

B. Designer, finding an application complete and correct, will certify the application and forward one copy to Contractor to indicate the action taken.

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.01 SCHEDULING AND ATTENDANCE

A. The Designer, in cooperation with the Owner and the Contractor, will schedule and administer a Pre-Construction Conference, periodic Progress Meetings, and other specially called or required meetings.

B. Representatives of the Owner and the Designer will attend.

C. Representatives of the Contractor, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents. In the case of the Contractor, the representative shall be one who is authorized to sign change orders.

1.02 PRE-CONSTRUCTION CONFERENCE

A. A Pre-Construction Conference will be scheduled and conducted at the project site prior to the issuance of the Notice to Proceed.

B. The Pre-Construction Conference shall be attended by the Contractor's:

1. (Office) Job Manager
2. (Field) Job Superintendent
3. Major subcontractors' representatives
4. Major suppliers' representatives
5. Others, as desired.

C. The Pre-Construction Conference is intended to be an opportunity for the Contractor to review administrative, procedural, and temporary facilities requirements of the Contract Documents, and to ask questions concerning the Work.

1.03 PROGRESS MEETINGS

A. Progress Meetings will be scheduled and conducted at the project site prior to the Contractor's submittal of an application for payment, or when deemed advisable by the Designer.

B. Progress Meetings shall be attended by the Contractor's:

1. (Office) Job Manager
2. (Field) Job Superintendent
3. Subcontractors' representatives, as befits the agenda
4. Suppliers' representatives, as befits the agenda
5. Others, as appropriate.

C. Progress Meetings are intended to be a monthly opportunity for the Contractor to review and submit applications for payment, and attachments, and for a general review of the progress of the Work, aimed at identifying and mitigating impediments to timely completion.

D. Progress Meetings will be scheduled and conducted until final completion.

END OF SECTION

SECTION 01 31 90
ADMINISTRATIVE LOGS

PART 1 - GENERAL

1.01 SUBMITTALS LOG

A. If any shop drawings, product data, or sample submittals are required by the Contract Documents, maintain a submittals log to record the status of submittals made to the Designer.

1. Submit three (3) copies with each application for payment.

2. Clearly identify the Project.

3. Record activities with respect to shop drawings, product data, samples, and such other submittals which are required by the Contract Documents.

4. Indicate for each submittal made to date:

a. Title or name, and type of submittal.

b. Date submitted to the Designer.

c. Date returned by the Designer.

d. General nature of the Designer's response.

1.02 VISITOR LOG

A. Maintain visitor log in the field office (or with the Project Superintendent when no field office is required) to record visits by all persons not a part of the Contractor's forces, materials suppliers, or subcontractors' forces.

1. Submit three (3) copies with each application for payment.

2. Clearly identify the Project.

3. Indicate:

a. Visitor name and affiliation.

b. Date of visit.

c. Time of arrival and departure.

END OF SECTION

SECTION 01 32 15
PROGRESS SCHEDULES and REPORTS

PART 1 - GENERAL

1.01 INITIAL PROGRESS SCHEDULE

A. Submit within 21 days of award of the Contract, and not later than the date of submission of the first application for payment. Clearly identify the Project on the schedule.

B. Outline the orderly progress of the Work as planned from the Notice to Proceed through Substantial Completion on the contractually required date. Categorize the Work by Phase (if Phases are specified), major work area, and distinct trade or team, and divide into individual activities of one month or less duration each. Provide an identifiable relationship to the schedule of values. Identify projected monthly progress, points of 50% completion and Substantial Completion, and other major milestones.

C. A bar chart or critical path method is acceptable, or other method which is approved by the Designer.

1.02 SUBMITTALS SCHEDULE

A. Submit with the initial Progress Schedule. Clearly identify the Project, and format in a manner similar to the initial progress schedule, utilizing the same method, or make a part of the initial Progress Schedule.

B. Identify submittals to be made. Show date for submission and date by which Designer should respond, allowing sufficient time for review.

C. Designer may require revision of schedule if times allotted for review are insufficient.

1.03 UPDATED PROGRESS SCHEDULE

A. Submit three (3) copies with each application for payment.

B. Clearly identify the Project. Format in a manner similar to the initial progress schedule, utilizing the same method.

C. Indicate:

1. Work as initially scheduled.

2. Actual progress through the period covered by the current application for payment.

3. Planned progress through Substantial Completion, including extensions of time made by change order or construction change directive.

D. If actual progress falls behind projections, show how the backlog is to be made up so that the Work will be completed on time.

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Requirements of this Section are in addition to the requirements of the General Conditions.

B. This Section includes procedures for processing:

1. Shop drawings.
2. Product data.
3. Office samples.
4. Sample Warranties.
5. Mock-up samples.
6. Certificate of compliance.

C. Submittals as approved do not constitute a change order.

D. Submit all submittals under Contractor's Transmittal letter. Include the following:

1. Project by title.
2. Contractor's contract number.
3. Work and products by Specification Section and Article number.

E. Resubmittals: When Architect requires that a submittal be resubmitted, comply with requirements of this section.

1. Identify changes made since the previous submittal.

F. Notify Architect in writing at time of submittal of deviations from the requirements of the Contract Documents.

G. Make all submittals far enough in advance of scheduled dates for installation to provide sufficient time for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.

1. Architect's Review Time: In scheduling, allow at least 10 working days for Architect's review.
2. Delays caused by the tardiness of the Contractor in preparing and forwarding submittals will not be an acceptable basis for an extension of the Contract completion date or for consideration of alternate products which do not meet the specified requirements of this Project Manual.
3. Include submittal dates in Construction Schedule. See Section 01 32 15.

H. Where used in the Contract Documents, the words "or equal" or "or approved equal" shall be defined as "refer to the substitution requirements" specified in the Instructions to Bidders.

1.02 SHOP DRAWINGS

A. Reproduction of any portion of the Contract Documents for use as submittals for Shop Drawings is not acceptable.

B. Submit Shop Drawings in a clear and thorough manner.

1. Title each drawing with Project name.
2. Identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.

C. Identify the following:

1. Requirements of the individual section of Project Manual.
2. Field measurements.
3. Field construction criteria.
4. Relation to adjacent or critical features of the Work or products.
5. Conformance of submittal with requirements of Contract Documents.

D. Each sheet of Shop Drawings shall be stamped and signed by Contractor before submitting to Architect. Certify compliance with requirements of Contract Documents.

E. Review by the Architect shall not relieve Contractor from his responsibility in preparing and submitting proper Shop Drawings in accordance with his current obligations.

F. All submissions which, in the opinion of the Architect are incomplete, contain errors or have not been checked or only superficially checked, will be returned unchecked by the Architect for resubmission.

G. Fabrication of products or start of work before required Shop Drawings are approved by Architect and returned to Contractor shall be at Contractor's risk.

H. Required Printing: One set of reproducible prints and three sets of copies unless quantity is otherwise noted in an individual specification section.

1. This procedure is to be followed for each submission of a drawing or group of drawings until they are finally approved by the Architect.

I. Prepare coordination drawings and fully coordinate same with other trades and contiguous work.

1. Working drawings for coordination shall be submitted as directed by the Architect.

2. Architect reserves the right to require the submittal and/or approval of composite coordination drawings prior to the release of an individual Contractor's Shop Drawing and/or fabrication drawing.

1.03 PRODUCT DATA

A. Submit only pages which are pertinent.

1. Mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number.
2. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.

B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

C. Stamp and sign each set of manufacturer's product data before submitting to Architect to certify compliance with Contract Documents.

D. Number of Copies Required: Submit the number of copies which are required to be returned plus two copies which will be retained by the Architect, but not less than four in any case.

E. Upon approval, one copy of the approved data will be returned to the Contractor for his file. Contractor should submit additional sets above the minimum if he desires more than one copy with the Architect's comments.

1.04 OFFICE SAMPLES

A. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified, indicating colors, textures and patterns for Architect's selection.

B. Submit samples to illustrate functional characteristics of products, including parts and attachments.

C. Approved samples which may be used in the work are indicated in the specification section.

D. Label each sample with identification required for transmittal letter.

E. Number Required: As specified in individual specification section.

1.05 MOCK-UP SAMPLES

A. Where mock-up samples and similar samples are indicated in the individual specifications sections, comply with requirements for "Office Samples", and

process transmittal forms for mock-ups to provide a record of activity.

1.06 SAMPLE WARRANTIES

A. Submit for approval, sample copies of all specific warranties required in excess of one year duration.

B. Include sample warranties with related shop drawing submittal. Shop drawing review will not start without warranty submittal nor will shop drawings be released for fabrication or installation until sample warranty is approved.

1.07 CERTIFICATES OF COMPLIANCE

A. Where required by the specific specification sections, submit "Certificates of Compliance" certifying that all materials used in the work comply with all specified provisions thereof.

1. Submit in the form of a letter or company standard forms.
2. If test reports are submitted with "Certificates of Compliance". Test reports shall include data or dates of testing and results of testing.

1.08 TEST REPORTS

A. Test reports certified by an independent testing laboratory must be made available upon request by Architect.

END OF SECTION

SECTION 01 41 15
BASIC REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 CODES AND REGULATIONS

A. The Regulatory Requirements used for Tennessee Board of Regents projects are listed below as a convenience and may not be inclusive of all that apply. Others may also apply. Comply with all pertinent codes, standards, regulations and laws.

	Document	Source	Phone
1.	2006 International Building Code	International Code Council, Inc. 500 New Jersey Avenue NW, 6th Floor Washington, D.C. 20001	(202) 370-1800
2.	2006 International Mechanical Code Rules of the Tennessee Department of Commerce and Insurance Division of Fire Protection Chapter 0789-02-02 Codes and Standards		
3.	2006 International Fire Code		
4.	2008 National Electrical Code	National Fire Protection Association 1 Batterymarch Park Quincy, Massachusetts 02169	(800) 344-3555
5.	2006 Life Safety Code (NFPA No. 101-2006) (NFPA Standards as listed in NFPA 1, Chapter 2 – excluding NFPA 5000)		
6.	2007 Tennessee Elevator Safety Board Rules Chapter 0800-3-4 Elevators, Dumbwaiters, Escalators, and other Lifts	Tn. Dept. of Labor and Workforce Development Div. of Boiler & Elevator Inspection Elevator Safety Board 3rd Floor Andrew Johnson Tower 710 James Robertson Parkway Nashville, Tennessee 37243	(615) 741-2123
7.	2007 Board of Boiler Rules Chapter 0800-3-3 Boiler Inspections		
8.	ASHRAE standard 90.1-2004 Energy Standards for Bldgs except Low-Rise Residential Buildings	American Society of Heating, Refrigerating & Air Conditioning Engineers 1791 Tullie Circle NE Atlanta, Georgia 30329	(800) 527-4723
9.	ASHRAE standard 90.2-2004 Energy-Efficient Design of New Low-Rise Residential Buildings		
10.	ASHRAE standard 62.1-2007 Ventilation for Acceptable Indoor Air Quality		
11.	Tennessee Chapters 0780-2-1, Electrical Installations 0780-2-2, Codes & Standards 0780-2-3, Plan & Spec Review 0780-2-18, Equitable Restrooms	Tn. Dept. of Commerce and Insurance Div. of Fire Prevention, Codes Enforcement Sec. 3rd Floor Davy Crockett Tower 500 James Robertson Parkway Nashville, Tennessee 37243-1162	(615) 741-7190
12.	ADA Title II, 28 CFR parts 35 and/or 36 or, when applicable to specific Student Housing projects,	U.S. Department of Justice Civil Rights Division, Disability Rights Section-NYA 950 Pennsylvania, NW Washington, DC 20530	(800) 514-0301
	Uniform Federal Accessibility Standards, Fed-Std-795, April 1, 1988	Architectural and Transportation Barriers Compliance Board ATTN: OCE Suite 1000 @ 1331 F Street NW Washington, D.C. 20004	(202) 272-5434 (800) 872-2253 Tracy @ ext 30
13.	and, for Title III applications within Title II sites or facilities, 2002 North Carolina Accessibility Code w/ 2004 Amendments	N.C.Dept. of Insurance P.O.Box 26387 Raleigh, North Carolina 27611	(919) 733-3901

END OF SECTION

SECTION 01 43 25
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 CONTRACTOR'S RESPONSIBILITIES

A. Employ and pay for the services of an independent testing laboratory, approved by the Designer, to perform specified services and testing. Employment of laboratory does not relieve Contractor's obligations to perform the Work of the Contract.

B. Coordinate and pay for inspections and testing required by law, ordinance, rules, regulations, orders, or approvals of public authorities as required by the Contract Documents.

1. Furnish copies of Products Test reports as required.

2. Furnish incidental labor and facilities to facilitate inspections and tests and for storage and curing of test samples.

3. Notify the lab sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

4. Make arrangements with lab and pay for additional samples and tests required for Contractor's convenience.

1.02 TESTING LABORATORY

A. Qualifications:

1. Meet "Recommended Requirements for Independent Laboratory Qualification", published by the American Council of Independent Laboratories, and Basic requirements of ASTM E 329 "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".

2. Be authorized to operate in the State of Tennessee.

3. Submit copies to the Designer of the report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during the most recent tour of inspection with the memorandum of remedies of any deficiencies reported by the inspection.

B. Duties and limitations of authority:

1. Perform specified inspections, sampling, and testing of materials and methods of construction and promptly submit five copies of the written report of each test and inspection to the Designer.

2. Laboratory is not authorized to release, revoke, alter or enlarge on requirements of the Contract Documents, approve or accept portions of the Work, or perform duties of the Contractor.

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 GENERAL

1.01 GENERAL QUALITY CONTROL

A. Maintain quality control over products, services, site conditions and workmanship, to produce work of specified quality.

1.02 WORKMANSHIP

A. Comply with industry standards except where more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship

B. Perform work by persons qualified to produce workmanship of specified quality.

1.03 MANUFACTURER'S INSTRUCTIONS

A. When specification sections require that installation of work shall comply with manufacturer's printed instructions, a copy of the instructions shall be maintained at the project site during installation and until completion and acceptance.

B. Handle, install, connect, clean, condition, adjust and finish products in strict accordance with such instructions and comply with specified instructions.

1. Should project conditions or specified requirements conflict with manufacturer's instructions review with the Architect for further instructions.
2. Do not proceed with work without clear instructions.

1.04 MANUFACTURER'S CERTIFICATES

A. When required by specified sections, submit three copies of manufacturer's certificates that certify the products meet or exceed specified requirements.

1.05 MANUFACTURER'S FIELD SERVICES

A. When specified in specification sections, require supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up equipment, test, adjust, and balance of equipment as applicable.

B. Submit manufacturer's written report listing observations and recommendations to the Architect.

1.06 TESTING AND INSPECTION SERVICES: See Section 01 43 25.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 PROJECT CONDITIONS

A. This Section is not intended to limit types and amounts of temporary construction facilities and controls required. Omission from this Section will not be accepted as an application that such temporary activity is not required for successful completion of the work and compliance with requirements of the Contract Documents.

B. Provide and maintain each temporary construction facility and control when required for proper performance of the work. Terminate and remove when no longer needed or when permanent facilities, with proper authorization, are available for use.

C. Obtain and pay for all required applications, fees, permits and inspections required for temporary construction facilities and controls.

D. Install, operate, maintain and protect temporary construction facilities and controls in a manner and at locations which are safe, non-hazardous, sanitary and adequately protect project work, workmen and the public.

1.02 COST OF CONSUMED UTILITIES

A. Water Service Use Charges: Water consumed during construction is to be metered and paid for by the Owner.

B. Electric Power Service Use Charge: Cost of electric power consumed during construction is to be metered and paid for by the Owner.

1.03 REQUIREMENTS OF REGULATORY AGENCIES

A. Provide and maintain all temporary facilities in compliance with governing rules, regulations, codes, ordinances and laws of agencies and utility companies having jurisdiction over work involved in project.

B. Be responsible for all temporary work provided, and obtain any necessary permits and inspections for such work.

C. Contractors shall confine equipment, storage of materials, and operation of workmen to the limits indicated or directed and shall abide by law, ordinances, conditions stated in permits and directions of the Architect.

D. Do not interfere with normal use of roads in vicinity of project site except as indicated or as absolutely necessary to execute required work, and then only after

proper arrangements have been made with authorities having jurisdiction, including traffic control as applicable.

1.04 SPECIAL PRECAUTIONS AND REQUIREMENTS

A. Do not interfere with normal use of occupied areas in existing (adjacent) buildings, existing driveway access to existing adjacent buildings and existing building utility services, except as absolutely necessary to execute required work involving such facilities, and then only after proper arrangements have been made through the Owner with persons in charge of existing facilities.

B. Do not block required exits from existing buildings.

1.05 TEMPORARY FIELD OFFICES, TRAILERS AND TELEPHONE

A. Provide and maintain clean weather tight offices at the site for own use and the Architect and at which location he/she or his/her authorized agent shall be present, or to which either may be readily called at all times while the work is in progress.

1. Provide field office heated, lighted and provide with telephone service. All expenses in connection with the field office, including the installation cost and use cost of heat, air conditioning, light, water and janitor service.

B. Copies of permits, approved shop drawings, plans and specifications marked up-to-date with all revisions and all addenda shall be kept at said offices areas ready for use at all times.

C. All expenses in connection with Contractor's field offices, including the installation cost and use of telephones, shall be borne by the Contractor.

D. Maintain field office areas until final acceptance and then remove, unless the Architect orders or approves earlier removal.

E. Pay all costs, including utility installation costs to the field office.

F. Provide and maintain such additional storage trailers on the project as required. Located where directed by the Architect.

G. Contractor may be required to relocate their offices, as directed by Architect, during construction as work progresses.

1.06 TEMPORARY SANITARY FACILITIES

A. Provide temporary portable toilets, acceptable to public health authorities, as required to service the project. Maintain in a clean, sanitary condition. Locate as directed by Architect.

1.07 TEMPORARY WATER SERVICE

A. General: Water is available from water main indicated on site drawings.

B. Arrange for, provide and pay for temporary water connections to water main, installation of metered extension and suitable fixtures at termination of lines.

C. Provide sufficient branch lines of adequate size to serve the needs of all trades. Locate water supplies at convenient locations, as directed by Architect.

D. Provide insulated housings for temporary service lines to protect against freezing, when applicable.

1.08 TEMPORARY HEAT AND VENTILATION

A. Prior to permanent enclosure of the structure, provide temporary heat as necessary to complete the work.

1. Provide weather protection as required to carry on work during inclement weather and to protect work and materials from damage by weather.
2. Protection of work includes covering, temporary enclosures, heating materials and work under construction and for providing suitable working conditions.
3. Furnish temporary heat by Owner approved types of units or equipment which is safe, will not affect surrounding areas of Contract Work and is properly supervised while in use.

B. "Permanently enclosed" shall mean that permanent walls and roofs are in place and weather tight, windows are in place and glazed and all entrance enclosures are either permanently in place or provided with suitable temporary enclosures.

1. Polyethylene sheet is not considered a suitable temporary enclosure. One-half inch thick plywood tightly fit, sealed and supported and maintained can be considered a temporary enclosure.

C. After the structure is permanently enclosed, provide, operate and maintain until substantial completion, approved temporary heating and ventilating units to maintain that portion of the structure at suitable temperature and humidity conditions to complete the work.

1. Arrange temporary units to bring in sufficient outdoor air to ventilate the structure and to prevent build-up of harmful dusts and fumes and to remove excess moisture. During warm weather, provide an adequate supply of fresh air, when necessary, to properly ventilate moisture, dust, fumes from paints, cements or adhesives in tightly-enclosed areas where natural ventilation will not be sufficient.
2. Provide temporary heating and ventilating as follows:
   a. During normal working hours, minimum 50^{o} F.
   b. During placing, setting and curing of concrete, minimum 50^{o} F.
   c. For 10 days prior to placing interior finish materials and throughout interior finishing, painting, etc., and until final acceptance of work and occupancy by Owner, minimum 70^{o} F.
   d. Supply heat and ventilation in a manner which avoids rapid drying of material but permits material and building to dry so remaining

moisture will not affect finish material.

e. Operate temporary systems each day, including Saturdays, Sundays and holidays. Include necessary labor and approved operating personnel.

f. Supply all fuel required for temporary heating and ventilating, including all material, labor and supervision to connect same.

D. When permanent systems are used for temporary construction use, Contractor shall assume full responsibility for maintaining such equipment during and after use. Included in maintenance are the following:

1. Proper operation and maintenance of the mechanical equipment until acceptance of the project by Owner.
2. Maintenance of temporary filters in all equipment to prevent accumulation of dust and dirt in coils, housings and ductwork.
3. Prior to final inspection; replacement of temporary filters with new filters, thorough cleaning of coils and other equipment, putting entire system into first class condition, cleaning traps and devices, adjustment and removal of any and all materials and equipment not functioning properly.
4. Owner and Architect must be given access to and opportunity to inspect equipment and maintenance procedures at all times. Owner involvement will not relieve the Contractor from the responsibilities specified herein.

E. Use of permanent heating or cooling and ventilating equipment for temporary construction use shall not effect warranty. Warranty shall take effect at time of project acceptance by Owner.

F. Cost of Temporary Heat: Cost of all fuel consumed in conjunction with temporary heat or permanent system used for temporary heat shall be paid by the Contractor.

1. Electric resistance type heating units are not permitted.

G. During periods of extremely low temperatures when water pipes could possibly freeze or when such conditions are forecast, temporary heating must be monitored 24-hours a day, 7 days a week.

1.09 TEMPORARY LIGHT AND POWER

A. Provide necessary temporary electrical service and temporary wiring and outlets as required to meet project needs for temporary lighting and power at the start of the project, as work progresses and until acceptance by the Owner, excluding power to individual contractor's trailers.

B. Extend temporary service from public utility service. Provide meter and extend service with disconnect to central location on site and to electric panel board location near Contractors' office trailer area. Provide system sized as required to service project construction needs.

C. Construct temporary pole line as required.

D. Remove temporary service, light and power system when permanent services and systems are available for use. No temporary system component shall form a part of the permanent systems.

E. Electrical work for construction purposes shall conform to Federal, State and local safety requirements, as well as requirements of the National Electrical Code. Obtain and pay for required applications, permits and inspections pertaining to this work.

F. Provide all lamps required to service the project. Replace lamps and fuses throughout the life of the project.

G. Pay all costs for installation, maintenance, supervision and removal of temporary light and power systems.

H. Make connections for temporary heat. Check temporary heat requirements.

I. Temporary Lighting

1. Provide as required to service the project.
2. As interior partitions are erected, revise the temporary lighting arrangements so that not less than one lamp is provided in each space over 70 square feet in area. Lights shall also be installed, as directed by Architect, in smaller areas where required to provide adequate light for work being carried out in the space.

J. Both 240 volt and 120 volt power receptacles are required on the project.

1.10 CONSTRUCTION AIDS

A. Hoists and Cranes: Erect and maintain adequate hoisting facilities as required for the work.

B. Shoring and Bracing: Provide all shoring and bracing required for safety and proper execution of their work. Remove these items when the work is completed.

C. Temporary Partitions: Provide temporary dustproof, security partitions in corridors, door openings and wall openings separating new work from existing building. Construction methods and materials shall be approved by Architect prior to construction of partition. However, construction shall be similar to plywood sheathing over wood studs with 6 mil plastic film applied over sheathing sealing all joints. Seal partitions at floor, walls and ceilings.

1. Provide doors through temporary partitions with self closing devices and locks.

1.11 WEATHER PROTECTION

A. Protect work and existing or adjacent property against weather, to maintain work, materials, apparatus and fixtures free from injury or damage during the entire

construction period. Work likely to be damaged shall be covered or protected at the end of each day's work. Any work damaged by failure to provide protection required, shall be removed and replaced with new work at the Contractor's expense.

B. Remove all snow and ice as may be required for proper protection and execution of the work and protection and safety of the public.

C. Provide winter weather closures and temporary doors at all unclosed openings.

1.12 WATCHMAN SERVICE

A. If Contractor considers watchman services necessary or desirable for protection of his/her own interest, such services may be employed at his/her own complete expense.

1.13 SAFETY

A. Safety requirements shall be in accordance with the General Conditions.

B. Provide and maintain guard lights at all barricades, railings, obstructions in the roadways or sidewalks and at all trenches or pits adjacent to walks or roadways.

C. Strict attention and full adherence must be given the Williams-Steiger Occupational Safety and Health Act of 1970, U.S. Department of Labor.

1.14 SECURITY CONDITIONS

A. Security of building must be maintained during "non-standard" working hours (premium time). This includes, but is not necessarily limited to, verifying all entrance doors and windows are secured.

B. Contractor shall be responsible for all infractions of rules and regulations by his workers.

C. Loitering or wandering through the corridors and into rooms not connected with the project or into other buildings on site will not be permitted.

D. Erect a 6 foot high fence with gates to enclose construction site from all or part of the campus, provide:

1. Wire mesh (farm fence) or chain link type fabric with steel posts.
2. Locate where directed by the Owner
3. Provide metal gates, of same fabric as metal fence, where indicated.
4. Maintain fence and gates in working order at all times.
5. Except during working hours, keep gates locked at all times.

1.15 DUST CONTROL

A. Control dust originating within project limits using water or a dust palliative

acceptable to the Architect. When conditions create blowing dust and dirt that is considered higher than that normally encountered, Contractor shall cooperate with Architect in determining methods to help minimize blowing. This may involve, as a minimum, more frequent applications of dust palliative. Calcium chloride may not be used.

1.16 TEMPORARY SIGNS

A. Temporary Project Sign

1. Provide project sign approximately 4 feet by 8 feet.
2. Painting by professional sign painter, with text, design, layout and colors as directed by Architect.
3. Materials: 3/4" APA-AB-EXT. Plywood for sign face with pine or fir trim. Provide 4 x 4 treated wood posts of sufficient length and quantity to securely brace and support sign against wind pressure.
4. Locate sign as directed by Architect. Maintain until completion of project, then remove. Erect sign a minimum of 8 feet from public right of way.

B. Temporary Directional Signs: Provide as required to adequately direct traffic and personnel on site.

1.17 STREETS AND TRAFFIC

A. Cleaning and Repair

1. Contractors shall remove mud and spillage from public walks, streets and sewers without delay. Failure to clean areas promptly will result in areas being cleaned by the Owner at the responsible Contractor's expense.
2. Damage to roads or other facilities on the grounds, resulting from hauling, storage of materials, or other activities in connection with the work shall be repaired or replaced, at no expense to the Owner, by the Contractor causing the damage. Repairs or replacements shall be made to the satisfaction of the Architect.

B. Traffic

1. Notify local law enforcement agency at least two weeks in advance of any anticipated work affecting traffic flow.
   a. To assure maintenance of flow and to safeguard all parties involved in planning to maintain flow, a field inspection should be made jointly by the Architect and Contractor personnel before performing any work which would interrupt normal traffic patterns.
   b. Re-routing of traffic shall be planned, as to route and direction, in cooperation with the local law enforcement agency.

1.18 PARKING

A. Employees of Contractors and subcontractors must park vehicles in areas assigned to them. Parking on streets or in restricted areas is prohibited.

1.19 FIELD ENGINEERING

A. Employ a registered surveyor, registered in the State of Tennessee to lay out the building on the site and to locate and fix all site items such as site improvements and utilities and furnish a certified plat of this work.

B. Be responsible for accuracy of all lines, elevations and measurements of the work.

C. Exercise proper precaution to verify dimensions shown on Drawings before layout of the work.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Requirements of this Section apply to the Work of all other Sections.

B. Section Includes:

1. Transportation and Handling.
2. Storage and Protection.
3. Standards.
4. Manufacturers and Types.
5. Fabrications.
6. Shop Priming.
7. Prohibited Materials and Methods.

1.02 RELATED SECTIONS

A. Quality Control: Section 01 45 00.

B. Cutting and Patching: Section 01 73 29.

C. Shop Drawings, Product Data and Samples: Section 01 33 23.

D. Execution Requirements: Section 01 73 00.

1.03 STANDARDS

A. Standards, codes and regulations published by Manufacturer's Associations, governmental agencies and other regulatory authorities form a part of these Specifications as minimum requirements. Such references include the latest issue and all amendments up to 30 days prior to the Bid Date.

B. "Governing Authority" means all federal, state and local laws and regulations.

C. Where differences occur between the Contract Documents and such standards, the most restrictive requirement shall apply.

D. Supply all materials and perform all work in accordance with the Manufacturer's Specifications and installation procedures, and in conformance with published trade and manufacturer's association standards, unless specifically noted otherwise herein.

1.04 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site.

1. Transport products by methods to avoid product damage.
2. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
3. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and accepted submittals, and that products are properly protected and undamaged.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

1.05 STORAGE AND PROTECTION

A. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

B. Store products in accordance with manufacturer's instructions with seals and labels intact and legible.

1. Store products subject to damage by the elements in weathertight enclosures.
2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

C. Exterior Storage

1. Store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. Cover products which are subject to deterioration with impervious coverings.
   Provide adequate ventilation to avoid condensation.
2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign materials.

D. Arrange storage in a manner to provide access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage.

E. Protection After Installation: Provide coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

PART 2 PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS

A. Products include materials, equipment and systems.

B. Products incorporated into the work:

1. Comply with specifications and referenced standards as minimum requirements.
2. Manufactured and fabricated products:
   a. Design, fabricate and assemble in accordance with the best engineering and shop practices.
   b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
   c. Two or more items of the same kind shall be identical, by the same manufacturer.
   d. Products shall be suitable for service conditions.
   e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing by the Architect.
4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.
5. New and unused, except as otherwise indicated.

2.02 MANUFACTURERS AND TYPES (MODELS)

A. In some instances the Project has been designed around a specific manufacturer. In some sections of the specifications, other manufacturers are listed as acceptable. Equipment or materials from these manufacturers will be acceptable contingent upon their meeting the design, appearance and functional standards established by the specified items. If equipment or a material of an acceptable manufacturer requires changes; electrically, mechanically, structurally, from what is indicated on the drawings, it shall be the responsibility of the Contractor requiring such change, to pay all costs involved with no additional costs to the Owner.

B. Where more than one manufacturer or specific product is listed, provide any one named. No substitutions will be permitted after signing the contract.

C. Equivalent components (articles, devices, materials, forms of construction, fixtures, etc.) may be submitted to the Architect for approval prior to bidding regardless of listed manufacturers.

D. Where a performance is specified and no manufacturer is listed, submit through the Shop Drawing procedure the name of the manufacturer, the product proposed, and detailed information showing its characteristics. Such proposal shall meet or exceed the specification, line item by line item, or be rejected.

E. Where a choice of color, pattern, or texture is available for a specified product or item of equipment, the Architect will make a selection from the manufacturers highest or best, unless noted otherwise in the specifications.

2.03 FABRICATION

A. Fabricate all items in the shop insofar as practicable. Where items cannot be completely shop fabricated and assembled for shipment, assemble and fit in shop, disassemble and ship. Identify parts for field assembly.

B. Fabricate items to be straight, square, in proper alignment, and with hairline joints where joints are necessary and permitted. Pre-plan field joints to be as inconspicuous as possible; coordinate locations with Architect.

2.04 SHOP PRIMING

A. Shop prime or seal surfaces of all products to receive paint materials in accordance with the requirements of Section 09 91 00.

B. Apply a primer or sealer compatible with the specified paint materials.

C. In the event such a primer is determined to be incompatible with the specified finish paint system, provide a barrier coat or remove the primer and reprime as directed, at no additional cost to the Owner.

2.05 PROHIBITED MATERIALS AND METHODS

A. The following items are expressly prohibited:

1. Attachment Related Items
   a. Powder Fasteners: Powder fasteners are defined as anchors which are driven into place by any device which produces an impact force by use of a powder charge, compressed air, gas or any other propellent. Powder fasteners prohibited for the following conditions:
      1) Attachment of structural members.
      2) Where public may be endangered by misuse.
   b. Plug anchorage by use of wood, lead or plastic.
   c. Perforated steel strap iron for pipe or other support or anchorage.
   d. Suspension systems that are not independently supported.
      1) Ceiling grid systems shall not be supported from ductwork, electrical conduit, heating or plumbing lines, and vice versa.
      2) Each utility system and the ceiling system shall be a separate installation, each independently supported from the building structure.
      3) Where interference occurs, provide trapeze type hangers or other suitable supports for each system.
      4) Locate hangers and supports where they will not interfere with access to mixing boxes, fire dampers, valves, and other appurtenances requiring servicing.
2. Methods Related Items
   a. The penetration of floors and walls by pipes, ducts, or other penetrations unless openings are appropriately fire stopped by fire doors or fire dampers, and voids around pipes, ducts, conduits, etc. are sealed with fireproof materials.
   b. The use of ink marking pens on surfaces of any kind of materials receiving paint or other finish in exposed location.

3. Materials Related Items
   a. Asbestos or asbestos containing materials.
   b. Barbed wire in construction fencing.
   c. Water soluble treatment of insulation jackets or facings, to impede or retard smoke or flames.
4. Door Related Items
   a. Knock-down (KD) door frames.
   b. Thresholds raised more than 1/2" at doors indicated as wheel chair accessible.

PART 3 EXECUTION

Not Applicable

END OF SECTION

SECTION 01 62 25
PRODUCT OPTIONS and SUBSTITUTIONS

PART 1 - GENERAL

1.01 ENVIRONMENTAL HAZARDOUS PRODUCTS, MATERIALS, OR WASTES

A. Do not incorporate in the Work hazardous materials or products as currently defined in the Resource Conservation and Recovery Act of 1976 (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), or Environmental Protection Agency (EPA) regulations, rules, or requirements, as amended, unless the Contract Documents give no other option than to provide a material or product which contains a hazardous material, component, constituent, waste, or leachate. In studying the Contract Documents and carrying out the Work, report at once to the Designer the discovery of a product or material which contains hazardous materials, components, constituents, waste, or leachate.

B. Do not incorporate in the Work a product or material which contains concentrations of a constituent, component, or material above the threshold levels which would require adherence to hazardous waste disposal regulations as currently defined, or could cause a release or threat of release of a hazardous substance at a level that would require a remedial response or removal action as currently defined by RCRA, CERCLA, or the EPA.

C. Select materials and products meeting specified requirements which comply with EPA requirements as regards hazardous materials content. In making requests for substitutions, determine that materials and products proposed for substitution comply with RCRA, CERCLA, and EPA requirements.

1.02 SUBSTITUTIONS:

A. Requests for substitutions shall be submitted to Designer on the form exhibited as Section 01 62 32, or in a similar format which provides the same or more information. Substitute products should not be ordered and shall not be installed without written approval or acceptance from Designer. Contractor assumes all risks associated with premature ordering and installation of substitute products.

B. The specifically named manufacturers, products, and systems, and descriptive characteristics used in the Contract Documents normally serve only to establish a level of quality and a performance standard. Unless specific restriction is placed upon an item in the specifications, Contractor may submit proposals for substitutions. The Owner reserves the right to disallow substitutions. Contractor assumes risks associated with possible rejection of proposals for substitution submitted during the life of the contract.

C. Delays caused by tardiness of Contractor in preparing and forwarding submittals do not constitute an acceptable basis for consideration of substitute products. Delays due to factors which were in effect prior to project bidding do not constitute an acceptable basis for consideration of substitute products.

D. When making requests for substitutions, Contractor assumes the following reponsibilities:

1. To have personally investigated the proposed substitute product and determined it is equal or superior in all respects to that specified;
2. To provide the same warranty for substitute that Contractor would for that specified;
3. To provide complete cost data, and waive all claims for additional costs related to substitution which subsequently become apparent; and
4. To coordinate installation of the accepted substitute, making such changes as may be required for Work to be complete in all respects.

END OF SECTION

SECTION 01 62 32
SUBSTITUTION REQUEST FORM

To:	**Project:**
Attn:	
Specified Item:	**Proposed Substitute:**

1. The following are attached (Mark all that apply):

☐ **Complete Description** ☐ **Catalog**
☐ **Laboratory Tests** ☐ **Spec Data**

2. This substitution will have the following effects on dimensions, guages, weights, etc.:

3. This substitution will have the following effects on wiring, piping, ductwork, etc.:

4. This substitution will have the following effects on other trades:

5. This substitution will have the following effect on construction Schedules:

6. The proposed substitute(s) differs from the specified product(s) in quality and performance as follows:

7. Manufacturers guarrantees for the substitute(s) and the specified product(s) are (check one):

☐ **the same** ☐ **different** (if different, explain below)

8. Information on the availability of maintenance services and replacement materials for proposed substitute(s) is provided on an attached sheet if applicable. This attachment is:

☐ **attached** ☐ **not applicable**

9. Names, addresses, and phone numbers of fabricators and suppliers for proposed substitute(s) are provided on an attached sheet if applicable. This attachment is:

☐ **attached** ☐ **not applicable**

10. If the proposed substitution is accepted, it will result in:

☐ **no cost impact** ☐ **a cost increase of**

☐ **a cost decrease of** _____

(If change in cost is indicated, itemization on specified Cost Itemization Form is attached)

11. License fees or royalties are pending on the proposed substitute.

☐ **No** ☐ **Yes** (if yes, explain below)

12. The undersigned or the firm represented shall pay for additional studies, investigations, submittals, redesign, and analysis by the Designer necessitated by this substitution request.

Substitutions must be requested in accordance with applicable Contract requirements. After bidding, substitutions are to be submitted only by Contractor. Substitute products should not be ordered or installed without written acceptance.

Submitted by: **Date:**

Sign here: _____ _____

Name: **Telephone:**

type or print: _____ _____

for:

Name of firm: _____

Address:

Street address: _____

and mailing address if different: _____

City, State, and Zip Code: _____

Designer's Review Comments:

☐ **Accepted** ☐ **Rejected**

☐ **Accepted as noted** ☐ **Rejected (received too late)**

☐ **Rejected (submittal incomplete)**

Additional comments:

For the Designer: **Date:**

Signature here: _____ _____

SECTION 01 73 00

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Requirements of this Section apply to the Work of all other Sections.

B. Section Includes:

1. Examination of Substrate.
2. Preparation.
3. Installation.
4. Workmanship.
5. Protection.
6. Overhead Attachments.

1.02 RELATED SECTIONS

A. Quality Control: Section 01 45 00.

B. Cutting and Patching: Section 01 73 29.

C. Submittal Procedures: Section 01 33 23.

D. Product Requirements: Section 01 60 00.

1.03 STANDARDS

A. Standards, codes and regulations published by Manufacturer's Associations, governmental agencies and other regulatory authorities form a part of these Specifications as minimum requirements. Such references include the latest issue and all amendments up to 30 days prior to the Bid Date.

B. "Governing Authority" means all federal, state and local laws and regulations.

C. Where differences occur between the Contract Documents and such standards, the most restrictive requirement shall apply.

D. Supply all materials and perform all work in accordance with the Manufacturer's Specifications and installation procedures, and in conformance with published trade and manufacturer's association standards, unless specifically noted otherwise herein.

1.05 NON-CONFORMING WORK

A. Faulty work or work not in conformance with the Contract Documents will not be permitted by the Architect.

1. It is the responsibility of the Contractor to propose a remedy by means of detailed drawings and written documentation and submit such documentation to the Architect for comments.
2. All costs for the removal and reconstruction of such work, as well as additional services of the Architect, shall be paid for by the Contractor.

PART 2 PRODUCTS - NOT APPLICABLE

PART 3 EXECUTION

3.01 EXAMINATION OF SUBSTRATE

A. Examine the substrates or structure to which a product is to be applied or installed. Do not proceed until unsatisfactory conditions have been corrected. Starting the work indicates acceptance of conditions and the installer assumes full responsibility for results.

B. Check the substrate or structure for proper tolerances and clearances. Tolerances are listed under individual specification Sections.

3.02 PREPARATION

A. Substrate: Where the products are applied to a substrate, prepare the substrate as recommended by the product manufacturer. That generally includes the following:

1. Bringing substrate to a uniform surface by smoothing uneven surfaces and filling holes, cracks and depressions with recommended filler or compatible type material.
2. Depressed Slabs: Bring to required elevation to receive finished materials where finished materials cannot completely fill depression. Use approved cementitious filler or compatible type material. Coordinate depressed slab locations with finish material locations.
3. Remove substances such as dust, oils and other foreign matter, not compatible with the product.
4. Surfaces shall be dry, unless moisture content or wetting requirement is specified or recommended.

B. Concrete Slabs: Provide steel shot abrasive cleaning of concrete slabs receiving designated finish flooring materials.

1. Designated Finish Flooring Materials
   a. Cementitious or cementitious set materials.
   b. Sheet flooring materials.
   c. Waterproofing materials.
   d. Paint materials.

e. Polymer or epoxy type seamless flooring.

2. Equipment: Electric powered portable unit with self-contained dust collection system. Size(s) of unit(s) and shot media suitable for conditions and proposed finish materials. WHEELABRATOR CORP. (800/544-4144) "Blastrac" or similar type system by SASE COMPANY INC. (800/522-2606), BW MANUFACTURING (616/447-9076) or INNOVATECH (800/267-6682).
3. Cleaning: Remove concrete surfaces to sufficient depth to remove bond breakers and contaminants such as curing compounds, oils, and other foreign matter which may be detrimental to the completed flooring installation.
   a. Work smoothly and evenly over entire surface; avoid creating dips, ridges, or other imperfections which would show or telegraph in the completed installation.
   b. Small transitions for different flooring materials may be obtained by multiple passes if carefully executed to create smooth even slope of not more than 1/8" in 2 feet.
4. Clean floor as near as possible to flooring installation to avoid contamination from work of other trades. Protect clean floor from soiling with suitable sheet materials. Reclean soiled areas.

C. Inserts and Anchorages

1. Anchorages where not detailed are the responsibility of the installer to design a suitable connection, structurally sound, and aesthetically acceptable to the Architect. Furnish calculations, drawings and product data when requested by the Architect. Such information may or may not be returned as indicated in Section 01 33 23.
2. It is the responsibility of the installer to furnish built-in fastening devices for his/her product to the proper trade for installation as the work proceeds.
3. In the event such devices are not furnished in time to be built-in, it is the installer's responsibility to provide other methods for attaching their product. Submit drawings and other required data to the Architect.

D. Templates: Provide templates, diagrams and other coordinating documents to the proper Contractor, manufacturer or supplier of related items affecting the Work.

E. Dimensions

1. If the exact location of an item is not indicated by dimension on the Drawings or noted in the Specifications, the Architect reserves the right to determine such location in the field prior to roughing-in.
2. If the exact dimensions of a product are not indicated, the Architect reserves the right to determine dimensions prior to the ordering or fabrication of a product.
3. Such dimensional changes shall not be a basis for changes in the Contract Sum.
4. Where miscellaneous devices, such as thermostats, switches, controls, grilles, pipes, or outlets of any nature are not specifically located by the Contract Documents, request such location or obtain approval of the

location prior to installation. If approval has not been obtained, the Architect may direct the relocation of such devices at the expense of the installer.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's recommendations or the requirements of trade associations, listed standards, Shop Drawings and Contract Documents.

B. If a conflict exists between these references, the most strict requirements govern. If printed instructions are not available, consult with the manufacturer or the manufacturer's field representative, where applicable.

C. Provide hangers, auxiliary framing, and other means for installing ceiling suspension systems, lighting fixtures, diffusers, and other equipment in ceilings to avoid ductwork, piping, etc.

1. Suspend from structural members (i.e. joists, beams, etc.), and not from ductwork or piping.
2. Provide supplemental framing members (i.e. angles, tubes, light gage steel framing, etc.) to span between structural members where required to support items of this paragraph C.

D. Install work that will not interfere with the proper installation of the Work of other trades.

E. Install work in a manner to facilitate operating, servicing and repairing.

F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

G. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.04 WORKMANSHIP

A. Install products straight, plumb, level and in line. Securely attach items to the substrate, using recommended adhesives, mechanical fasteners or other devices. Where holes are provided for attachment, do not field drill or cut new holes without the approval of the Architect.

B. Where applicable, match finished work to the approved samples or mock-ups.

C. Conceal fasteners wherever possible, unless exposed fasteners are permitted or specified.

D. Weld in accordance with AWS standards; comply with AWS for qualifications of

operators and for workmanship.

E. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

F. Recheck measurements and dimensions, before starting each installation.

3.05 PROTECTION

A. Protect finished surfaces of product being installed and surrounding products from damage during installation. Provide protective devices as required and as recommended by the manufacturer. Cover work subject to damage at the end of each day's work.

B. Coat concealed surfaces of metal products with a bituminous or other approved coating to prevent contact between dissimilar metals or other material which can cause deterioration.

C. Correct damage by repairing or replacing as directed by the Architect. Repairing will be permitted only where the repair is undetectable and does not cause structural damage or interfere with proper functioning of the part.

D. Protect finish of installed products until Substantial Completion of the Project by use of wrappings, covers or other approved protective devices. Remove such protection immediately prior to final cleaning.

E. Limiting Exposures: Coordinate and supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.06 OVERHEAD ATTACHMENTS

A. Where overhead hangers are required, and not indicated on the drawings, provide one or more of the following as required:

1. Concrete inserts prior to placement of concrete or drilled type inserts after concrete is placed.
2. Trapeze from adjacent structure with suitable steel framing.
3. Connections to Structure: Suitable anchorage devices with a minimum load carrying capacity of 250 pounds plus safety factor of 4:1 for the applied load.
    a. Concrete: Steel expansion anchors. See Prohibited Material and Methods specified in Section 01 60 00.
    b. Steel: Bolted or welded connections to steel structure.

B. Where metal deck is furnished with hanger tabs or similar devices, applied total load, including work of other trades, not to exceed 75 pounds for each device. Loads in excess of permitted limit to be supported by trapeze framing as specified

above.

C. Verify support requirements of heavy or unusual loads not specifically shown on drawings with Architect.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 GENERAL

1.01 DESCRIPTION

A. Execute cutting, fitting or patching of Work, required to:

1. Make several parts fit properly.
2. Uncover Work to provide for installation of ill-timed Work.
3. Remove and replace defective Work.
4. Remove and replace Work not conforming to requirements of Contract Documents.
5. Remove samples of installed Work as specified for testing.
6. Install specified Work in existing construction.

B. In addition to contract requirements, upon written instructions of Architect:

1. Uncover Work to provide for Architect's observation of covered Work.
2. Remove samples of installed materials for testing.
3. Remove Work to provide for alteration of existing Work.

C. Do not endanger any Work by cutting or altering Work or any part of it.

1.02 SUBMITTALS

A. Prior to cutting which affects structural safety of Project, submit written notice to Architect, requesting consent to proceed with cutting, including:

1. Identification of Project.
2. Description of Affected Work.
3. Necessity for cutting.
4. Affect on other Work, on structural integrity of Project.
5. Description of proposed Work. Designate:
    a. Scope of cutting and patching.
    b. Contractor and trades to execute work.
    c. Products proposed to be used.
    d. Extent of refinishing.
6. Alternative to cutting and patching.

B. Should conditions of Work, or schedule indicate change of materials or methods, submit written recommendation to Architect, including:

1. Conditions indicating change.
2. Recommendations for alternative materials or methods.
3. Submittals as required for Substitutions.

C. Submit written notice to Architect, designating time Work will be uncovered, to provide observation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching of materials and surfaces shall be in accordance with the requirements of the Contract Documents. Where not otherwise defined, patching shall match adjacent surfaces and proper materials shall be provided accordingly.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of Work, including elements subject to movement or damage during cutting and patching.

B. After uncovering Work, inspect conditions affecting installation of new products.

3.02 PREPARATION PRIOR TO CUTTING

A. Provide shoring, bracing and support as required to maintain structural integrity of Project.

B. Provide protection for other portions of the Project, including all Contractors' personnel.

3.03 PERFORMANCE

A. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances, finishes.

B. Execute cutting and demolition by method which will prevent damage to other Work, and will provide surface to receive installation of repairs and new Work.

1. No cutting shall be performed which will, in any way, reduce the structural strength of the building. Should such cutting be necessary, consult Architect and do not proceed with such operation unless written approval is given.

C. Restore Work which has been cut or removed; install new products to provide completed Work in accord with requirements of Contract Documents.

D. Patching of materials and surfaces shall be in accordance with the requirements of the Contract Documents. Where not otherwise defined, patching shall match existing or adjacent surfaces and proper materials shall be provided accordingly.

1. Wherever existing walls, floors, ceilings, etc., are cut, the exposed surfaces

must be neatly finished by patching, painting, wall covering, etc., as required to blend patched areas into adjacent existing surfaces. Patched areas shall not be visible when viewing entire wall surface.

2. Where painting or finishing of patched surfaces or application of wall or floor covering is required, finish the entire plane of surface in which patched area occurs.

3.04 SLEEVES AND OPENINGS

A. Where pipes, conduits, ductwork or other materials pass through new walls, partitions, floors, roof or ceilings, provide suitable sleeves in these elements or provide openings where sleeves are not practical.

B. Close sleeves and openings to prevent passage of smoke or fire using approved methods and materials to maintain the fire rating of the construction being penetrated. See Section 07 84 00.

1. Unless otherwise indicated, extend floor sleeves 2" above finished floor.

C. Where pipes, conduit, ductwork etc., pass through, behind, or above existing construction, provide all cutting, patching, and refinishing for doing this work as specified herein.

D. Penetrations under beams or other concentrated loads require approval of Architect.

END OF SECTION

SECTION 01 74 00

CLEANING

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Execute cleaning, during progress of the work and at completion of the work (final cleaning), as required by Contract Documents.

1.02 WORK SPECIFIED IN OTHER SECTIONS

A. Cutting and Patching: Section 01 73 29.

B. Cleaning for Specific Products or Work: Specification section for the work.

1.03 CLEANING AND DISPOSAL REQUIREMENTS

A. Standards: Maintain project in accord with the following safety and insurance standards:

1. Applicable Federal and State Requirements.
2. National Fire Protection Association.

B. Hazards Control: Comply with the following requirements:

1. Store volatile wastes in covered metal containers, and remove from premises daily.
2. Prevent accumulation of wastes which create hazardous conditions.
3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on project site.
2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary sewers.
3. Do not dispose of waste into streams or waterways.
4. Wet down dry materials and rubbish to prevent dust.

D. Clean streets, highways, and private properties of all mud, earth, rubbish, rocks, refuse or other debris of any kind resulting from such work or related transportation to and from the work site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Select and use cleaning materials and equipment with care to avoid scratching, marring, defacing, staining or discoloring surfaces cleaned.

B. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

C. Use cleaning materials only on surfaces recommended by the cleaning material manufacturer.

PART 3 EXECUTION

3.01 DURING CONSTRUCTION

A. Provide, maintain and empty 55 gallon metal and dumpster type containers for collection of waste materials, debris and rubbish. Locate containers as directed by Architect.

1. Provide containers with adequate capacity to accommodate anticipated needs. If containers do not have adequate capacity, increase intervals of waste removal or capacity of containers until adequate capacity is provided.

B. At reasonable intervals during progress of Work, but in no case less than once a week, clean site and public properties and dispose of waste materials, debris and rubbish.

C. Direct Special Attention To:

1. Provide non-staining layout lines and other markings on masonry and concrete. Use chalk lines wherever possible and remove when no longer needed.
2. Remove all stains from concrete surfaces, including floors.
3. Shop marks shall not appear on exposed surfaces of any item.
4. Remove concrete, mortar and paint spatters.
5. Clean both brick and concrete unit masonry.
6. Protect aluminum frames during construction and thoroughly clean upon completion of the installation.

D. Clean interior surfaces before start of finish painting and continue cleaning on an as-needed basis until painting is finished.

E. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

G. Vacuum interior building areas where work is performed prior to painting and other

finish work. Continue vacuum cleaning on an as needed basis until building is ready for occupancy.

H. Protect interior of ductwork during construction from accumulation of dirt, dust or debris.

I. Clean trash from all chases and concealed spaces before final enclosure.

3.02 FINAL CLEANING

A. At the completion of the work, remove all surplus material, false work, temporary structures, including foundations thereof, plants of any description and debris of every nature resulting from their operations and put the site in a neat and orderly condition.

1. Exposed painted ductwork to be brushed clean of dust.

B. Remove temporary protection and labels not required to remain

C. Clean surfaces of equipment; remove excess lubrication.

D. Remove debris, rubbish, dirt, etc. from open concealed spaces, chases and above ceilings.

E. Repair, patch and touch-up marred surfaces to specified finish, to match adjacent surfaces.

F. Maintain cleaning until Final Completion.

G. Employ experienced workmen, or professional cleaners for final cleaning.

H. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

I. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight-exposed interior and exterior surfaces, including light fixtures and lenses; polish surfaces so designated to a shine finish.

1. Clean finishes free of dust, stains, films and other foreign substances.
2. Clean transparent and glossy materials to a polished condition; remove foreign substances. Polish reflective surfaces to a clear shine.
3. Vacuum clean carpeted and similar soft surfaces.
4. Clean resilient and floor finishes as specified.

J. Remove waste, foreign matter, and debris from roofs, gutters, areaways, and drainage systems.

K. Remove waste, debris, and surplus materials from site. Clean grounds; remove stains, spills, and foreign substances from paved areas and sweep clean. Rake clean other exterior surfaces.

L. Clean plumbing fixtures to a sanitary condition.

M. Clean permanent filters of ventilating equipment and replace disposable filters when units have been operated during construction; in addition, clean ducts, blowers, and coils when units have been operated without filters during construction.

N. Clean light fixtures and lamps; polish lenses.

O. Clean dirt and debris from interior of all electrical panels and user accessible electrical enclosure boxes prior to installation of covers or in the case of hinged access doors, before final cleaning of adjacent space. Clean the exterior surfaces of all switchgear located in Mechanical and Electrical Rooms and spaces.

P. Clean dirt and dust from interior of air handling units before installing final filters. Wipe down the exterior surfaces of all HVAC equipment located in Mechanical Rooms and spaces.

Q. Prior to Final Completion, or Owner occupancy, Contractor shall conduct an inspection of sight exposed interior and exterior surfaces, and all work areas, to verify that the entire work is clean.

END OF SECTION

SECTION 01 77 70
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 PRE-CLOSEOUT SUBMITTALS

A. Submit required tabulations when Work reaches seventy-five percent completion; however, regardless of percent completion, submit not later than 30 days prior to the scheduled date on which Substantial Completion is required.

B. Submit tabulations of:

1. Equipment and systems for which the specifications require demonstrations or training, indicating relevant specification sections, scheduled time and place for demonstration and training sessions, and intended audience. Adjust schedule if instructed by Designer to do so.

2. Equipment and systems for which operating and maintenance data are required in the Operating and Maintenance Data Binders and related documents are required in the Project Data Binders.

3. Spare parts and extra materials required, indicating the relevant specification sections, and the appropriate party to whom the items are to be delivered.

1.02 REQUEST FOR CLOSEOUT INSPECTION

A. SUBSTANTIAL COMPLETION:

When Contractor considers Work substantially complete, Contractor shall submit to Designer:

1. written assertion that Work is Substantially Complete;

2. a list of items to be completed or corrected and dates scheduled for completion or correction of each item;

3. certification that orientation and training for facility maintenance personnel is complete or written assertion that such orientation and training will be certified prior to inspection;

4. written assertion that Operating & Maintenance Data Binders are complete and available or will be prior to inspection;

5. written assertion that Use and Occupancy Permit(s) are complete and available or will be prior to inspection; and,

6. written assertion that an application for payment will be prepared commensurate with the degree of completion and submitted at the Substantial Completion inspection.

B. FINAL INSPECTION:

When Contractor considers Work complete, Contractor shall submit to Designer:

1. certification that a qualified person authorized by Contractor has reviewed the Contract Documents and inspected the Work;

2. written assertion that the Work is complete and in accordance with Contract Documents and ready for Final Inspection;

3. written assertion that additional materials necessary to augment the Operating & Maintenance Data Binders with instructions for adding these to the Binders, or full replacement Binders, are complete and available or will be prior to inspection;

4. written assertion that Project Data Binders and Construction Record Documents are complete and available or will be prior to inspection; and,

5. an application for final payment

C. Upon receipt of an appropriate request for inspection, Designer will schedule an inspection meeting with Contractor, and Owner's representatives to determine the status of completion.

1.03 RESULTS OF CLOSEOUT INSPECTIONS

A. Should the Designer determine that Work is not complete to the degree asserted by Contractor, Designer will promptly notify Contractor in writing stating the deficiencies. Contractor shall take immediate steps to remedy deficiencies and make a request for Re-Inspection.

B. SUBSTANTIAL COMPLETION: Designer will prepare a Certificate of Substantial Completion accompanied by a list of items to be completed or corrected, and will submit Certificate to Contractor and to Owner for signature with an accounting of Liquidated Damages due, when Designer verifies that:

1. Work is Substantially Complete based on an inspection conducted pursuant to an appropriate request for Closeout inspection;
2. orientation and training for facility maintenance personnel is complete; and,
3. Operating & Maintenance Data Binders are complete and have been delivered to the Owner.

C. FINAL INSPECTION: Designer will certify that the Work is Complete, and will initiate Final Adjustments, when Designer verifies that:

1. Work is complete in accordance with Contract Documents based on an inspection conducted pursuant to an appropriate request for Closeout inspection;
2. orientation and training for facility maintenance personnel is complete; and,
3. additional materials necessary to augment the Operating & Maintenance Data Binders with instructions for adding these to the Binders, or full replacement Binders, are complete and have been delivered to the Owner.
4. Project Data Binders and Construction Record Documents are complete and have been delivered to the Designer.

1.04 RE-INSPECTION FEES: If the Work fails a Closeout inspection, and a subsequent inspection is requested and conducted based on Contractor assertion of the same stage of completion, Owner will compensate Designer for performing such Re-Inspection as additional services, and deduct the amount of such compensation from the Contract Sum by appropriate modification.

1.05 FINAL ADJUSTMENTS

A. When Designer has certified that the Work is complete, Designer will determine whether modification is needed to reflect appropriate adjustments to Contract Sum which were not previously effected. If such modification is needed, Designer shall assist the Owner in its preparation and deliver it to Contractor, who in the case of a change order, shall sign and return it to Designer.

B. When Designer has certified that the Work and needed modifications to the Contract are complete, and if necessary, Designer will instruct Contractor to submit a revised final application for payment.

1.06 ONE-YEAR CORRECTIVE INSPECTION

A. An inspection will be scheduled and conducted at project site prior to one year from date Substantial Completion was achieved, but as close to the end of that year as is reasonably possible.

B. The inspection will be attended by at least one representative each of Owner, Designer, and Contractor.

C. The inspection will confirm non-conforming items previously identified for correction by the Owner, and whether corrections have been completed or are still outstanding, and is intended to be an opportunity for Contractor to become aware of any outstanding corrections needed.

END OF SECTION

SECTION 01 78 21
CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.01 DATA BINDERS

A. Provide two complete sets in durable, commercial quality, plastic covered, three ring binders. Identify project and type of data on face and side.

B. Provide information required by Contract Documents, including:

1. Cover sheet giving complete project title and number, Contractor's name, address, phone number, superintendent's name, and related information.

2. Table of Contents identifying material in Binder, and identifying missing materials to be added later or certifying completeness of Binder.

C. OPERATING & MAINTENANCE DATA BINDERS

1. Provide Product Data, including: manufacturer; model number; names, addresses, and telephone numbers of suppliers, installers, and servicers; related information for repair, renovation, or additions.

2. Provide Operating and Maintenance Data, including: instructions and schedules for proper operation, maintenance, servicing, and lubrication with manufacturer's parts list, illustrations, assembly drawings, maintenance diagrams, and list of recommended lubricants and cleaning agents; as-installed control diagrams and coordination drawings with color coded piping and wiring diagrams; valve tag charts with numbers, locations, and functions; panel board circuit directories; and, list of materials and parts furnished for Owner. Review brochures and manufacturer's standard printed information for data pertaining to models other than those actually provided, and mark to clearly omit inapplicable information and identify units actually installed.

D. PROJECT DATA BINDERS

1. On the form exhibited as Section 01 78 88, provide a complete list of subcontractors and material suppliers, including dollar amount, company name, address, phone number, local representative, and information regarding minority-owned business status.

2. Provide Certificate of Substantial Completion, Use and Occupancy Permits, and Certificate(s) of Inspection or letter(s) of acceptance from governing authorities as apply.

3. Provide Contractor's warranty of the work.

4. Provide guarantees, warranties, bonds, certifications, maintenance agreements, service contracts, and related documents, including beginning date, duration, information about instances which might affect validity, and proper procedure in case of failure.

1.02 CONSTRUCTION RECORD DOCUMENTS: Keep the record copy of Contract Documents required by paragraph 3.11 of the Conditions in good condition and in the course of the Work, legibly mark these to record actual conditions of Work, including: location, depth, and identification of new and existing underground items, utilities, valves, tap points, equipment, service access, test points, and related features; field changes in dimensions and detail; changes by addenda or Modification; and, description and details of features for maintenance, service, replacement, or expansion of the Work.

END OF SECTION

SECTION 01 78 25
DATA BINDER RECEIPT

PART 1 - GENERAL

1.01 RELATED SECTIONS

Section 01 29 76 Payment Procedures
Section 01 77 70 Close-Out Procedures
Section 01 78 21 Close-Out Submittals

1.02 CONTRACTOR PREPARATION AND USE OF THIS FORM

A. Use this form or a reasonable facsimile to verify delivery of Data Binders. Fill in the identifying information following this paragraph, then use the prepared form as a receipt, for signature by the person to whom Data Binders are delivered. Provide a copy of the receipt with the application for payment.

1. For the Application for Payment commensurate with Substantial Completion, provide a copy indicating delivery of Operating and Maintenance Data Binders.

2. For the Application for Payment commensurate with Final Completion, provide a copy indicating delivery of Project Data Binders.

B. Identifying Information:

1. For the Work:

Project Title, including SBC project number, institutional location, and work name:	

2. For the Data Binder:

Cross out that which does not apply.	Operating & Maintenance Data Binder Project Data Binder

1.03 RECIPIENT SIGNATURE

A. By signature below, recipient acknowledges receipt of the Data Binder identified above, but does not certify the completeness or correctness of the Data Binder.

Recipient Signature:	
Please legibly indicate recipient's name and title or affiliation with Owner:	

END OF SECTION

SECTION 01 78 88
REPORT OF SUBCONTRACTORS AND SUPPLIERS

Project	SBC Project Number	Page
		of

Use first entry on first page for General Contractor

Work performed or Material Supplied, and Dollar Value	Firm name and address	Principal Contact and Phone	If a Minority-Owned Business, classification and certifying agency. If not, "NO".

SECTION 01 79 21
DEMONSTRATION and TRAINING

PART 1 - GENERAL: not used

PART 2 - PRODUCTS: not used

PART 3 - EXECUTION

3.01 Equipment Start-up / Commissioning

A. Conduct demonstration and instruction as soon as practicable upon installations, and prior to Substantial Completion inspection. Substantial Completion shall not be certified, nor shall Owner be required to assume responsibility for operating, maintaining, or insuring system, prior to complete demonstration and instruction.

B. Demonstrate operation of newly provided equipment and systems to Designer and to Owner's representative. Instruct Owner's personnel in operation, adjustment, and maintenance of equipment and systems, using the operating and maintenance data as the basis of instruction.

C. Make lists of persons witnessing equipment and systems demonstration, and persons receiving operating instruction, using a format similar to the form included in Section 01 79 25 with project, subject, trainer, session information, and attendees identified. Include copy of lists in the Operating and Maintenance Data Binders.

END OF SECTION

SECTION 01 79 25
DEMONSTRATION AND TRAINING VERIFICATION

PART 1 – GENERAL

1.01 Use a copy of this page as a planning form for demonstrations and training. Fill in the basic identifying information below:

SBC Project Number: _____

Institution/Location: _____

Project Name: _____

Required date of Substantial Completion

Owner's Facility Coordinator: _____ Phone: _____

Owner's Maintenance Contact: _____ Phone: _____

Contractor Contact: _____ Phone: _____

1.02 If a list of required demonstrations and training has been specified in Division 1, use that list as a starting point, review the project manual for other specifications that require training of the Owner's operators, and complete the list below. Check the box on left if Demonstration and Training is required on the standard listed subjects; add subjects as identified by review of the specifications and check the box to the left of each; and, schedule and indicate an target date for each. If the number of training subjects exceeds the available space provided here, replace or continue the list on a similarly formatted separate page. Submit the list with the initial Progress Schedule, and update as necessary during the Work to ensure that advance notice of the demonstration and training schedule is acceptable to the Designer.

	Spec Reference	Subject	Target Date	Actual Date
		Accessibility		
		Boiler		
		Chiller		
		Controls		
		Data Transmission		
		Electrical		
		Elevator / Conveying		
		Fire Alarm		
		Irrigation		
		Mechanical		
		Plumbing		
		Telecommunications		

PART 2 – PRODUCTS: not used.

PART 3 – EXECUTION

3.01 For each session conducted, use this page as a **Training Verification Report**.

A. Fill in the information below prior to the session ("End Time" may be filled in after):

SBC Project Number: _____

Institution/Location: _____

Project Name: _____

Subject Equipment / System:	
Spec Reference	

Demonstration and Training (by whom, where, when)	Trainer Name:	Company:		Phone:
	Place:	Date:	Start Time:	End Time:

B. Minimum Agenda Requirements:

☐ System Walk-through ☐ Operation ☐ Trouble-shooting ☐ Maintenance ☐ Safety

C. Attendance: Each person receiving the demonstration and training shall sign in below, or on a similarly formatted continuation page:

Initials	Legibly print your name	Unit and title or function

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide rough carpentry work as shown and specified. Work includes:

1. Roof curb openings blocking and nailers.
2. Concealed blocking for support of accessories, equipment, specialty items, cabinets, fixtures, trim and facing materials. Provide where necessary whether indicated or not.
3. Plywood sheathing.
4. Preservative treatment.
5. Rough hardware and accessory materials.

1.02 RELATED SECTIONS

A. Exterior Sheathing Board: Section 09 21 16.

1.03 REFERENCES

A. Standards

1. American Plywood Association (APA): Grades and Standards
   a. APA Plywood Design Specification, Form No. Y510T.
   b. APA Engineered Wood Construction Guide, Form No. E30R.
2. American Wood Preservers Association (AWPA): Treatment Standards.
   a. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties Pressure Treatment.
   b. AWPA C9 - Plywood Pressure Treatment.
3. PS - U.S. Product Standard: Softwood Lumber and Plywood Standards
   a. PS-1 - Construction and Industrial Plywood.
   b. PS-20 - American Softwood Lumber Standard.

1.04 SUBMITTALS

A. Shop Drawings: Submit shop drawings indicating framing connection details, fastener connections and dimensions.

B. Preservative Treated Wood: Submit certification by treating plant stating chemical and process used and conformance with applicable standards.

1.05 QUALITY ASSURANCE

A. Softwood Lumber: Grading rules and wood species shall conform with the

voluntary Product Standards PS 20 including grading rules of the following associations, as applicable:

1. Southern Pine: Standard Grading Rules for Southern Pine Lumber, published by Southern Pine Inspection Bureau (SPIB).
2. Douglas Fir, Western Larch and Hemlock: Western Lumber Grading Rules, published by Western Wood Products Association (WWPA), or Standard Grading and Dressing Rules for West Coast Lumber Inspection Bureau (WCLIB).
3. Western Spruce, Pine and Fir: Western Spruce-Pine-Fir Association (WSPFA) and current Canadian Grading Rules by National Grades Association, Canada.

B. Softwood Plywood: Grading rules and wood species shall conform with Product Standard PS 1.

C. Grade Marks

1. General: Identify all lumber and plywood by official grade mark.
2. Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping, or combination designation, rules under which graded, where applicable and condition of seasoning at time of manufacture.
3. Softwood Plywood: Appropriate grade trademark of the American Plywood Association.
   a. Type, grade, class and identification index.
   b. Inspection and testing agency mark.

1.06 STORAGE AND HANDLING

A. Store off the ground.

B. Protect from direct contact with the weather.

C. Provide proper ventilation.

D. Adhesives

1. Do not store adhesives with materials that have a high capacity to absorb VOC emissions (i.e., materials which are woven, fibrous or porous in nature, such as acoustical ceilings, carpets, textiles, etc.).
2. Do not store adhesives in occupied spaces.

1.07 JOB CONDITIONS

A. Time delivery and installation of carpentry work to avoid delaying trades whose work is dependent on, or affected by, the carpentry work and to comply with protection and storage requirements.

B. Installer must examine the surfaces and supporting structure and the conditions

under which the carpentry work is to be installed, and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

C. Correlate location of furring, nailers, blocking, grounds and similar supports so that attached work will comply with design requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Dimension Lumber - General

1. Nominal sizes are indicated, except as shown by detailed dimensions. Provide lumber complying with lumber producer's inspection agency grading rules certified as conforming to the "National Grading Rule for Dimension Lumber," by Board of Review of the American Lumber Standards Committee (ALCS), established under Section 10 of PS 20.
2. Dress dimension lumber S4S unless otherwise shown or scheduled.
3. Provide seasoned dimension lumber with 19% maximum moisture content at time of dressing and complying with the dry size requirements of PS 20. Mark lumber "S-DRY".

B. Light Framing Lumber: Where framing lumber from 2" through 4" thick, and 4" or less wide is indicated, provide lumber complying with the specified requirements for dimension lumber and with the following grading, unless otherwise indicated:

1. Provide "Construction" grade light framing and mark "CONST".
2. Where stud framing is shown, provide "Stud" grade lumber and mark "STUD".
3. Specie: Any commercial softwood.

C. Miscellaneous Lumber

1. Provide wood for support or attachment of other work such as cant strips, nailers, blocking, furring, grounds, bucks, stripping and similar members. Provide lumber of the sizes shown or specified, worked to shapes shown and as follows:
   a. Specie: Any commercial softwood, construction grade.

E. Plywood: Provide exterior grade plywood for exterior use and interior type with exterior glue for interior use.

1. Concealed Use
   a. Exterior: APA-CD-EXT.
   b. Interior: APA-CD-EXPOSURE I, with exterior glue.
2. Exposed Interior Use - Painted Finish: APA MEDIUM DENSITY OVERLAY (MDO).

3. Backing Panels: APA CD PLUGGED INT with exterior glue, square edge.

2.02 PRESERVATIVE WOOD TREATMENT

A. Pressure treat all wood lumber members in contact with masonry or concrete with water-borne preservatives in accordance with AWPA C2 for lumber to comply with AWPA Standard T-1 and U-1.

1. Provide ACQ or CBA-A; CHEMICAL SPECIALTIES, INC. Preserve; OSMOSE NatureWood; WOLMANIZED Natural Select.
2. Retention
   a. ACQ: Minimum 0.25 lbs./cu. ft.
   b. CBA-A: Minimum: 0.20 lbs./cu. ft.

B. Mark each piece of treated lumber with AWPA Quality Mark designation denoting conformance to the appropriate specification.

C. After treatment, kiln-dry lumber and plywood to maximum 19% moisture content. Inspect each piece of lumber after drying and discard damaged or defective pieces.

D. Complete fabrication of treated items before treatment, where possible. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment.

2.03 ROUGH HARDWARE

A. General: Provide all necessary spikes, screws, nails, bolts and other hardware for satisfactory erection of work. Except where noted to be stainless steel, provide hot-dipped galvanized finish for hardware exposed to exterior, located in toilet rooms, in contact with treated wood or in contact with roofing or flashing.

1. Nails: Common wire nails, except where noted otherwise on drawings; sizes as noted or specified herein.
2. Attachment to Concrete or Masonry: Metal expansion type shields or inserts; sizes as required to accommodate applied fastener; spacing as indicated on drawings.
   a. "DH" or "Ankr-Tight" by WEJ-IT or equal by RED HEAD or HILTI.
   b. Sleeve type for masonry.
   c. Wedge type for concrete.
3. Attachment to Steel Studs: Self tapping screws of sufficient length and strength to perform the functions for which they are used.
4. Roof Construction
   a. Wood-to-Wood Attachment: 300 Series stainless steel, flat head.
      1) Plywood to Nailers: Minimum #8 x 1-3/4".
   b. Wood-to-Metal Deck Attachment: Hot dip galvanized in accordance with ASTM A153; machine bolts, locknuts and washers; minimum 3/8" diameter.

B. Provide plates, anchors, hangers and other miscellaneous steel and iron shapes as required for framing and supporting woodwork and for anchoring or securing

woodwork to concrete or wood structures.

2.05 MISCELLANEOUS ITEMS

A. Adhesive - For field gluing panels to framing or to other wood panels: Low-VOC, FS MMM-A-125C, Type II, water- and mold-resistant. Use ASTM D3110, dry-use type for laminated and finger-jointed members, certified in accordance with ASTM C557 and complying with required VOC regulations.

PART 3 EXECUTION

3.01 INSTALLATION

A. General

1. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate the work with a minimum of joints or the optimum jointing arrangement.
2. Fit carpentry work to other work. Scribe and cope as required for accurate fit.
3. Set wood framing accurately to required lines and levels.
4. Cut, join and tightly fit framing around other work.
5. Anchor and nail as indicated, or if not indicated to comply with the Authorities having jurisdiction (local Codes).
6. Fasteners
   a. Use common wire nails, except as otherwise shown or specified herein.
   b. Use finishing nails for exposed work.
   c. Do not wax or lubricate fasteners that depend on friction for holding power.
   d. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials.
   e. Make tight connections between members.
   f. Install fasteners without splitting of wood; predrill as required. Do not drive threaded friction type fasteners; turn into place.
   g. Tighten bolts and lag screws at installation and retighten as required for tight connections prior to closing in or at completion of work.
   h. Countersink nail heads on exposed carpentry work and fill holes.
   i. Provide washers under bolt heads and nuts in contact with wood.
7. Nail plywood to comply with the recommendations of the American Plywood Association.

B. Wood Grounds, Nailers and Blocking

1. Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached or screeded.
2. Coordinate location with other work; refer to shop drawings of such work, if any.

3. Attach to surfaces securely with anchor bolts or other attachment devices as shown, and as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry as work progresses, cutting to fit masonry unit size involved. Anchor to formwork before concrete placement.
4. Provide grounds of dressed, key-bevelled lumber not less than 1-1/2" wide and of the thickness required to bring face of ground to exact thickness of finish material involved.
   Remove temporary grounds when no longer required. Where indicated as permanent grounds, provide treated lumber.
5. Anchor plates, blocking, nailers, etc. to masonry and concrete masonry units (units with cores grouted solid) with minimum 1/2" diameter fasteners spaced at 4' o.c., unless otherwise indicated. Situations requiring special bolting shall be with size and spacing of bolts as required.

3.02 MISCELLANEOUS INSTALLATIONS

A. Backing Panels: Provide plywood backing panels for electrical and telephone equipment where indicated.

1. Provide fire-retardant material at interior locations.
2. Provide preservative treated material at exterior locations.

3.03 WOOD TREATMENT

A. Preservative Treated Wood Products: Provide pressure treatment for all lumber and plywood as specified hereinbefore.

B. Field Cuts: Apply 2 brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.

3.04 CLEANING

A. Clean up debris and cuttings daily. Remove and dispose of excess materials and debris created by carpentry.

B. Maintain the building and site free of accumulations of cutting and waste materials in a neat orderly condition acceptable to the Architect.

3.05 WASTE MANAGEMENT

A. Do not burn scraps of treated wood. Do not mix treated wood scraps with untreated wood. Hazardous wastes shall be separated, stored, and disposed of according to local regulations.

END OF SECTION

SECTION 06 61 17

SOLID SURFACE COUNTERTOPS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work includes solid surfacing countertops with integral sink bowls and splashes as indicated on the drawings.

1.02 RELATED SECTIONS

A. Rough Carpentry: Section 06 10 00.

1.03 SUBMITTALS

A. Submit shop drawings for countertops.

1. Provide large scale details.
2. Indicate methods of fabrication, edging, location and construction of joints.

B. AWI Quality Standards: A photo-copy of the applicable portions of the AWI publication "Architectural Woodwork Quality Standards", latest edition, shall be submitted with each set of shop drawings.

1. Each copy must be marked to clearly show all details, specifications and finishes proposed for this work.

C. Submit samples of the solid surface counter top.

D. Manufacturer's product data describing solid surface counter top material.

1.04 QUALITY ASSURANCE

A. Fabricator qualifications: A firm specializing in the fabrication of solid surface items with a minimum of 5 years experience and a satisfactory record of performance on projects of comparable size and quality. Fabricator shall be acceptable to the Architect.

B. Installation: Performed only by skilled finish carpenters with a minimum of 3 years experience in installing custom solid surface items similar to that required for this project.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect materials and items during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver materials and items until concrete, masonry, painting, grinding and other similar wet work has been completed and is thoroughly dry.

C. Store materials in dry, well-ventilated spaces with constant minimum temperature of 60 degrees F., and maximum relative humidity of 55%.

1.06 PROJECT CONDITIONS

A. Provide and maintain a constant temperature and humidity before, during and after installation as required to maintain optimum moisture content of installed materials.

B. Obtain measurements and verify dimensions and details before proceeding with architectural woodwork.

PART 2 PRODUCTS

2.01 BASIC MATERIALS AND FABRICATION METHODS

A. Solid Surface Material

1. Material: Homogeneous filled acrylic meeting ANSI Z124.3 and .6, Type Six, and Fed. Spec. WW-P-541E/GEN.
2. Basic Minimum Material Properties
   a. Hardness: 52-60 Barcol ASTM D785.
   b. Specific Gravity: 1.53-11.8 g/cc ASTM D972A
   c. Tensile Strength: 4000 ASTM D638.
   d. Flexural Strength: 7000 ASTM D790.
   e. Izod Impact: .24 ASTM D256.
   f. Thermal Expansion: .000018-.0000042 in./in./^{o}C ASTM D696.
3. Thickness: ¾".
4. Colors: As selected by Architect.

B. Manufacturer

1. Basis of Design: Drawings and specifications are based on products fabricated from Corian by DuPONT, Staron by SAMSUNG/CHEIL INDUSTRIES or equal.
2. Other Manufacturers: Products by other manufacturers will be considered during bidding. Products must meet the performance requirements specified, match colors selected as determined by the Architect, conform to details indicated on the drawings and be approved by Architect.

B. Fabrication

1. Fabricate to dimensions, profiles and details indicated with openings and mortises precut, where possible to receive fixtures, accessories and other similar items of work.
2. Ease edges as indicated on the drawings. Fabricate edges with solid surface material, except as otherwise indicated.

3. Complete fabrication and other work before shipment to site to the greatest extent practicable. Disassemble components where necessary for fitting at site. Provide ample allowance for scribing, trimming and fitting.
4. Secure bowls and splashes or similar items to countertop per manufacturer's installation method; seamed undermount "S".

C. Measurements: Prior to fabrication of items required to be fitted to other construction, obtain field measurements and verify dimensions and Shop Drawing details as required for accurate fit.

2.02 MISCELLANEOUS MATERIALS

A. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, nonporous joints, with chemical bond.

B. Screws: Select material, type, size and finish required for each use. Comply with FS FF-S-111.

PART 3 EXECUTION

3.01 PREPARATION

A. Condition materials, items and products to average prevailing humidity conditions in installation areas before installing.

B. Install blocking and anchoring devices built into substrates for anchorage of solid surface fabrications.

C. Deliver inserts and anchoring devices to be built into substrates well in advance of time substrates are to be built.

3.02 INSTALLATION

A. General

1. Install items plumb, level, true and straight with no distortion.
2. Shim as required using concealed shims.
3. Install to a tolerance of 1/8" in 8'-0" for plumb and level, with no offset in flushness of adjoining surfaces.

B. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

C. Install countertops level, true to alignment, accurately fit to wall conditions and securely fastened to base units and other support systems as indicated.

3.03 CLEANING AND PROTECTION

A. Repair damaged and defective items to eliminate functional and visual defects.

Where not possible to repair properly, replace items as directed by the Architect.

B. Protect installed work during remaining construction operations.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide metal doors and frames as indicated and specified. Work includes, but is not limited to:

1. Standard steel doors and frames.
2. Fire rated steel doors and frames.

1.02 RELATED SECTIONS

A. Hardware: Section 08 71 10.

B. Wood Doors: Section 08 14 00

1.03 QUALITY ASSURANCE

A. Provide metal doors and frames fabricated by one manufacturer to ensure uniformity in appearance and construction.

B. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

1. ANSI: American National Standards Institute.
2. ASTM: American Society for Testing and Materials.
3. SDI: Steel Door Institute.
4. DHI: Door and Hardware Institute.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of standard metal door and frame required.

B. Submit shop drawings. Identify doors and frames in accordance with drawing door schedule. Indicate:

1. Elevations of each door design.
2. Hardware locations, installation methods and hardware reinforcements.
3. Dimensions and shapes of materials, anchorage and fastening methods.
4. Door frame types, profile of molding and details.
5. Wall opening construction and connection to other work.

C. Product Data. Provide single source supplier for the Work of this Section.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver metal doors and frames cartoned or crated for protection during transit and job delivery. Provide sealed wrapping for factory.

B. Store doors and frames inside the building in a dry, well-ventilated area. Protect from damage, wetting and deterioration in accordance with manufacturer's recommendations.

1.06 LABEL DOOR REQUIREMENTS

A. Comply with the label requirements of NFPA and applicable local codes. Fabricate doors and frames in accordance with requirements of NFPA Standard No. 80 and UL Standard for Safety No. 10B for the class of door opening shown or scheduled.

1. Provide UL labels permanently fastened on each door and frame which is within the size limitations established by NFPA and UL for labeling.
2. Provide anchors for UL labeled frames required by the authority having jurisdiction.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: STEELCRAFT MFG. CO; AMWELD BUILDING PRODUCTS DIV.; CECO CORP.; PIONEER INDUSTRIES; REPUBLIC BUILDERS PRODUCTS CORP.; FENESTRA; CURRIES.

2.02 MATERIALS AND COMPONENTS

A. Standard metal doors and frames: Comply with SDI 100 material and fabrication recommendations and as specified.

B. Standard Metal Doors

1. Provide flush seamless type doors with seamless faces and edges, 1-3/4" thick, internally reinforced. Top and bottom closed flush.
   a. Provide glass lites where indicated.
2. Exterior Doors: Provide Grade III (extra heavy duty), Model 2 (seamless design). Fabricated from ASTM A526, 16 gage, commercial quality stretcher level, galvanized steel face sheets with ASTM A525 G60 or A60 zinc coating, mill phosphatized, 1-1/2 lb. density polyurethane insulated core U-factor 0.09, tops and bottoms closed with flush galvanized steel caps.
3. Interior Doors: Provide Grade II (heavy duty), Model 2 (seamless design). Fabricated from ASTM A366, 18 gage, commercial quality, stretcher level, cold-rolled steel face sheets with a Kraft resin impregnated honeycomb or polystyrene slab core bonded to door face sheets with thermal adhesive.
4. Hardware Reinforcements: Meet or exceed SDI 107 requirements.

5. Edge Profile: 1/8" bevel in 2" core on hinge and lock edges.
6. Astragals for pairs of doors: Manufacturer's standard for labeled and non-labeled openings. Factory prepare for hardware as scheduled in Section 08 71 10. Mount astragal to overlap on key side of doors.

C. Standard Metal Frames

1. Interior Frames: Fabricated from ASTM A366, commercial quality cold rolled steel, 16 gage. Set-up and welded type, all miters clean cut, reinforced, fully seam welded with exposed welds ground smooth.
2. Exterior Frames: Fabricated from ASTM A526, 16 gage commercial quality galvanized steel with ASTM A525 G60 or A60 zinc coating, mill phosphatized. Set-up and welded type, all miters clean cut, reinforced, fully seam welded with exposed welds ground smooth.
3. Profile: Double rabbet, jamb face and depth as indicated.
4. Hardware Reinforcements: Meet SDI 107 requirements.
5. Transoms and Sidelites: Provide for loose glazing stops to be secured with countersunk screws.
    a. Provide ¾" stops for sidelites and transoms where the individual glass areas for fire rated openings exceeds the allowable area for 5/8" stops.

D. Fire Doors and Frames

1. Comply with Label Door Requirements specified herein before.
2. Agency: Underwriter's Laboratories.
3. Classification: As indicated.
4. Conform to requirements of Standard Metal Door and Frames specified herein.

E. Frames for Glazed Openings (Borrowed Light): Minimum 18 gage with integral stop, profile and size per drawings. Provide loose metal glazing stops of same gage as frame.

1. Provide for loose stops to be secured with countersunk screws.

    a. Provide ¾" stops for sidelites and transoms where the individual glass areas for fire rated openings exceeds the allowable area for 5/8" stops.
2. Verify thickness of glazing material before fabrication and glazing clearances required.
3. Frame components to be fully welded, except required loose glazing stops, at connections with exposed welds ground flush and smooth with frame surfaces.
4. Fire Rated Frames: Provide for ratings indicated in accordance with paragraph 2.02D herein.

2.03 FABRICATION

A. Reinforce and prepare doors and frames to receive hardware. Fit for hardware at

the factory to template. Do all necessary cutting, drilling and tapping. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.

B. Provide surfaces smooth and free from defects, warp or buckle with arrises straight and sharp.

C. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for surface applied finish hardware may be done at project site.

D. Locate finish hardware as shown on final shop drawings or, if not shown, in accordance with DHI "Recommended Locations for Builder's Hardware."

E. Door and Frame Fabrication

1. Provide cutouts for mortised hardware, accurately located and made to fit hardware.
2. Punch frames for door silencers, three on strike side for single doors. Factory install plastic caps. Stick-on silencers are not acceptable.
3. Exterior and Interior Frames: Provide minimum three anchors of suitable design for each jamb. Provide galvanized anchors for units built into exterior walls.
4. Floor Anchors: Provide floor clip on bottom of each jamb. Provide angle spreaders at bottom of each set-up frame.
5. Conduit for Door Frames
   a. Shop install ¾" electrical conduit within hollow metal door frame where indicated or where required for electric strikes or similar type electrical frame mounted hardware.
   b. Route conduit in frame in the most direct and simple manner so that pulling wire can be performed with a minimum of bends and obstructions. Route conduit to avoid damage to conduit during field installation of frame and operations to grout frame solid.
   c. Connect conduit to electrical junction box or conduit embedded in building structure by means of a threaded coupling. The termination point of the conduit within the frame shall be free and have enough slack to make final connection to embedded device.

F. Shop Painting

1. Clean, bonderize or chemically treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
2. Clean steel surfaces of mill scale, rust oil, grease, dirt and other foreign materials before application of paint. Sand free of imperfections.
3. Apply one baked-on shop coat of rust-inhibitive prime paint in accordance with ASNI A224.1. Provide a smooth, uniformly finished surface ready to receive finish paint.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, rough openings and installation conditions. Do not proceed with metal door and frame work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Before installation, apply one coat of bituminous protective paint over shop primer to all concealed frame surfaces built into exterior openings.

3.03 INSTALLATION

A. Install metal doors and frames in accordance with manufacturer's installation instructions and final shop drawings.

B. Placing Frames

1. General
   a. Comply with ANSI A250.11 (Revision of SDI 105) "Recommended Erection Instructions for Steel Frames."
   b. Erect frames in proper position to receive partition work before construction of enclosing walls. Set frames accurately in position, plumbed, aligned with heads level and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders.
   c. Grout frames as indicated on the drawings. Coordinate grout placement with adjoining materials and door hardware.
2. At Masonry Construction: Locate wall anchors at 16" on center. Building-in of anchors and grouting of frames is specified in Section 04 00 00.
3. Fire-Rated Frames: In accordance with NFPA standard No. 80.
4. Metal Stud Partitions: Install at least 3 wall anchors per jamb at hinge and strike levels. Attach wall anchors to studs with tapping screws.

C. Door Installation

1. Install doors plumb and in true alignment in prepared openings. Fit metal doors accurately in frames, within clearances specified in ANSI/SDI A250.8 (SDI100).
2. Install fire-rated doors with clearances as specified in NFPA Standard No. 80.

D. Immediately after erection, sand smooth rusted or damaged areas of door and frame coat and apply touch-up prime coat of compatible air-drying primer.

3.04 FIELD QUALITY CONTROL

A. Final Adjustment: Provide final adjustment as follows:

1. Door Contact with Silencers: Doors shall strike a minimum of two (2) silencers without binding lock or latch bolts in strike plate.
2. Head, Strike and Hinge Jamb Clearance: 1/8".
3. Meeting Edge Clearance, Pairs of Doors: +1/16"
4. Bolts and Screws: Leave tight and firmly seated.

END OF SECTION

SECTION 08 14 00

WOOD DOORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide the following types of wood doors:

1. Solid core
2. Fire rated

1.02 RELATED SECTIONS

A. Installation: Section 06 20 00.

B. Hollow Metal Door Frames: Section 08 11 13.

C. Door Hardware Section 08 71 00.

1.03 QUALITY ASSURANCE

A. Provide wood doors fabricated by one manufacturer to ensure uniformity in appearance and construction.

B. Reference Standards

1. Underwriters' Laboratories - UL 10B (neutral pressure) and UL 10C (positive pressure) - Fire Tests of Door Assemblies
2. Window and Door Manufacturers Association (WDMA): WDMA IS 1A-04.
3. Architectural Wood Work Institute: AWI "Quality Standards, Guide Specification" requirements.
4. NFPA 80 - Fire Doors and Windows
5. NFPA 252 - Standard Methods of Fire Tests for Door Assemblies

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of wood door required.

1. Include details of core and edge construction.
2. Include certification indicating compliance with specification requirements.

B. Submit Shop Drawings

1. Indicate location and size of each door, elevation of each kind of door,

details of construction, location and extent of hardware blocking and other pertinent data.

2. Identify doors in accordance with drawing door schedule.

C. Submit sample corner section, 12" square, showing required veneer and edge construction.

D. Finish Samples

1. Factory Finished Doors: Submit three (3) flitch samples of each species of face veneer with factory applied stain and finish as specified and indicated illustrating expected range of color and grain variation.

2 Field Finished Doors: Submit three (3) flitch samples of each species of face veneer as specified and indicated illustrating expected range of grain variation. Samples will be used to select and approve field stain color as specified in Section 09 91 00.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store and protect doors in accordance with manufacturer's recommendations and WDMA.

B. Following are general guidelines. For more specific information refer to WDMA's Appendix Section “Care and Installation at Job Site.”

1. Deliver doors in manufacturer's original unopened protective packaging or wrapper.
   a. Store doors flat and off the floor on a level surface in a dry, well-ventilated building. Do not store on edge. Protect doors from dirt, water and abuse.
   b. Do not subject interior doors to extremes in either heat or humidity. HVAC systems should be operational and balanced, providing a temperature range of 50 to 90 degrees Fahrenheit and 30% to 50% relative humidity.
   c. When handling doors, always lift and carry. Do not drag across other doors or surfaces. Handle with clean hands or gloves.
   d. Each door will be marked on top rail with opening number.

1.06 LABEL DOOR REQUIREMENTS

A. Fire Ratings Compliance: Comply with the label requirements of NFPA and applicable local codes. Fabricate doors and frames in accordance with requirements of NFPA Standard No. 80 and U.L. Standards as follows:

1. Neutral Pressure Testing - UBC 43-2 or 7-2-94; or UL10B.
2. Positive Pressure Testing UBC 7-2-97 or UL10C

B. Ratings Certifications

1. Provide U.L. labels permanently fastened on each door that is within the

size limitations established by NFPA and U.L. for labeling.

2. Provide anchors for U.L. labeled frames required by the authority having jurisdiction.

1.07 WARRANTY

A. Submit written warranty on door manufacturer's standard form, signed by manufacturer, installer and Contractor, agreeing to repair or replace defective doors which have been warped (bowed, cup or twist), or which show telegraphing of core construction below face veneer, or delamination, or do not conform to tolerance limitations of WDMA I.S.1A-04 or other defects in materials and workmanship for the life of the installation for interior doors.

B. Warranty shall also include furnishing, installing and finishing new doors meeting specification requirements that may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Interior Flush Doors Solid Core: Meet or exceed WDMA I.S.1A Industry Standard for Wood Flush Doors requirements and as specified.

1. Interior Flush Doors Solid Core – Non-Rated and 20 Minute Rated Fire Doors: Provide one of the following cores with hardwood veneers:
   a. Particleboard Core (PC-5) to comply with ANSI Standard A208.1 LD-2, with screw holding power of 125 lbs., modulus of rupture of 800 psi, modulus of elasticity of 150,000 psi and density of 30-35 lbs. per cubic foot. Formaldehyde free.
   b. Stave Lumber Core (SLC-5) may be a combination of solid, low-density hardwood lumber blocks or strips not more than 2-1/2" wide of one species of wood between 6% to 9% moisture content. Joints to be tight and staggered in adjacent rows. Lumber density is 25 to 27 lbs. per cubic foot. Formaldehyde free.
   c. Structural Composite Lumber Core (SCLC-5) is an engineered hardwood composite sometimes referred to as LSL (Laminated Strand Lumber). The material complies with WDMA minimum performance levels for interior applications with screw holding power of 540 lbs., modulus of rupture of 6,500 psi, modulus of elasticity of 1,300,000 psi and density of 38 lbs per cubic foot. Formaldehyde free.
2. Interior Flush Fire Doors – Above 20 Minute Rated: FD solid core with hardwood face veneer.
   a. Rating as indicated on drawings.
   b. Provide one of the above cores or the following as required to maintain fire rating:
      1) Non-combustible mineral composite material that is necessary for higher hourly ratings per manufacturer’s approval.

B. Moldings: Trim louver and glass openings with recessed bead type wood moldings, species matching door face veneer species. Profile as selected by the Architect from manufacturer's standard profiles.

2.02 FABRICATION

A. Flush Doors: Fabricate doors in accordance with WDMA "Premium Grade" requirements for transparent stained finish. Formaldehyde free.

1. Core Construction: Bond stiles and rails to core and sand entire unit prior to assembly of face veneers.
2. Number of Plies: 5.
3. Face Veneers: Minimum 1/50" thick before sanding, plain sliced, Grade A red oak hardwood.
4. Door Thickness: 1-3/4" thick.
5. Adhesive: Type I, waterproof.
6. Edge Strips: Stile edges hardwood species matching face veneer; bonded to core; 1-1/8" minimum width after trimming. Top and bottom edges hardwood of mill option.
7. Veneer Matching: Provide veneers book matched for color and grain.
8. Hardware: Factory machine for mortise hardware using template provided by hardware manufacturer.
9. Reinforcement: Reinforce doors to receive hardware specified.
    a. Hinge Attachment: Stiles and rails to be continuously glue bonded to the core so that screw stress is transmitted directly to the core.
    b. Closure, Exit Device and Other Surface Mounted Hardware: Provide top rail 2-1/2" or more in width to hold closer fasteners and solid wood blocking for all other surface applied hardware.

B. Fire Rated Doors: Conform to "Flush Door" requirements specified above. Provide doors of U.L. classification indicated.

1. Reinforcement: Reinforce doors to receive hardware specified.
    a. Hinge Attachment: Triple ply stiles by MARSHFIELD. One half inch, high density inner stile by ALGOMA or equal by other listed manufacturers.
    b. Surface applied hardware that is located where screws cannot penetrate the above mentioned stiles or wood rails shall be through bolted.

D. Finish:

1. Comply with recommendations of WDMA for finish. Manufacturer to factory prep units for field stain. Color as selected by Architect.

E. Individually package doors at factory with manufacturer's standard packaging or wrapping for delivery to job site.

F. Manufacturer: MARSHFIELD DOOR SYSTEMS; EGGERS; ALGOMA; OSHKOSH; V T INDUSTRIES.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substances, rough openings and installation conditions. Do not proceed with wood door installation until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Verify metal frame dimensions and hardware mortises in metal frames with metal frame manufacturer.

3.03 INSTALLATION

A. Condition doors to average prevailing humidity in installation area before hanging.

B. Install doors in accordance with manufacturer's installation instructions. Job fit and prepare doors to receive hardware. Bevel 1/8" in 2" at strike edges for clearance in arc of swing. Seal cut surfaces, tops, bottoms and edges with sanding sealer after fitting and machining.

C. Hang doors straight, plumb and square securely anchored into position. Adjust doors to provide uniform clearance and to contact stops uniformly. Remove and replace doors that are warped, bowed or otherwise damaged and cannot be properly fit to the opening.

D. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA No. 80.

3.04 PROTECTION

A. Protect installed doors from soiling, staining and damage until final acceptance.

B. Repair or replace doors damaged beyond acceptable repair as directed by the Architect.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.01 SCOPE

A. Finish hardware for aluminum, hollow metal and wood doors. Included is:

1. Screws, bolts, and other fasteners required to install door hardware.
2. Special tools required to install and adjust door hardware.

1.02 RELATED SECTIONS

A. Alternate No. 1: Section 01 23 00.

B. Finish Carpentry (Hardware Installation): Section 06 10 00.

C. Hollow Metal Door Frames: Section 08 11 13.

D. Wood Doors: Section 08 14 00.

E. Aluminum Entrance Doors: Section 08 41 13.

1.03 QUALITY ASSURANCE

A. Supplier: A recognized building hardware supplier who has been furnishing hardware in the project's vicinity for not less than two years and who is or employs an Architectural Hardware Consultant (AHC), who will be available at no additional cost to the Owner during the course of construction.

B. Scheduling: Performed by an AHC member of Door and Hardware Institute (DHI).

1. The AHC shall be present at completion of the work; check the installation, make all minor adjustments required, and supervise required hardware replacements and report to the Architect on completeness of the installation.
2. Identify locksets and latchsets function by manufacturer's number on itemized schedule of hardware submitted for approval.

C. Reference Standards: Whenever the following abbreviations are used herein they shall refer to the corresponding standard:

1. American National Standards Institute (ANSI)
   a. ANSI 117.1: Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
   b. ANSI A156.1: Butts & Hinges - Grade 1.

c. ANSI A156.2: Locks & Lock Trim - Grade 1.
d. ANSI A156.3: Exit Devices - Grade 1.
e. ANSI A156.4: Door Controls, Closers - Grade 1.
f. ANSI A156.13: Mortise Locks & Latches - Grade 1.

2. Builders Hardware Manufacturers Association (BHMA)
   a. BHMA Product Standards: Latest Edition.
   b. BHMA Standard for Materials Finishes: Latest Edition.
3. Door and Hardware Institute (DHI)
   a. DHI Publication: Recommended Locations for Architectural Hardware.
   b. DHI Publication: Hardware for Labeled Fire Doors.
   c. DHI Publication: Supplement Hardware for Labeled Fire Doors.
4. ADA: Americans with Disabilities Act, Title III.

C. Codes and Regulations: All hardware listed or furnished shall meet requirements of Federal, State and Local codes having jurisdiction over this installation.

1. Any item furnished that does not meet code requirements, shall be removed and proper items substituted at no additional cost or expense to the Owner.

1.04 SUBMITTALS

A. Schedules: Submit detailed finish hardware schedule in accordance with Section 01 33 23. Schedule shall be complete and include product type, manufacturer's name and model number, and finish of every item required.

B. Product Data Sheets: Submit copies of manufacturer's catalog cut sheets for every item that is detailed in the finish hardware schedule in accordance with Section 01 33 23.

C. Samples: Submit one sample of each item of finish hardware included in your schedule for inspection and approval. Samples may later be used on project.

D. Templates: Furnish templates for fabrication of the following related work not included in this section: hollow metal doors and frames, aluminum doors and frames, wood doors, and any other related work areas.

E. Keying Schedule: Submit keying schedule for approval in accordance with DHI's Keying Systems and Nomenclature Handbook.

F. Operation Manuals: Furnish operation and maintenance manuals to owner.

G. Certification: Submit notarized certification indicating that hardware furnished for labeled doors and doors requiring physically handicapped access complies with requirements of governing authorities and applicable regulations.

1.05 DELIVERY, STORAGE AND HANDLING

A. Package each item of hardware and each lockset, complete with all necessary

screws, anchors, instruction and installation templates. Identify packages by indexing with corresponding item number of the Hardware Schedule.

B. Deliver packaged hardware items at proper time for installation. Provide secure locked storage for hardware. Control handling of items that are not immediately replaceable to prevent delays due to hardware loss.

C. Contractor and hardware supplier shall jointly inventory hardware when delivered to job site for agreement with the hardware schedule and promptly report errors or discrepancies to the Architect.

D. Store, handle and install hardware in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration.

1.06 PROJECT CONDITIONS

A. Examine detail drawings and provide fittings to details as required.

B. Provide all necessary material templates of physical hardware to required fabricators of doors, door frames and other work requiring factory preparation for hardware installation. Upon request, check shop drawings of such other work to confirm adequate provisions are made for proper installation of hardware.

C. Meet with Architect and Owner's personnel on request, to establish final keying requirements.

1.07 WARRANTY

A. Warranty

1. All hardware items, except for those listed below, shall have a written one year limited warranty against defects in workmanship and operation.
2. Manufacturers of hardware assume no responsibility or liability of items that are improperly handled, installed, or maintained.
3. The hardware items listed below shall carry the following standard warranties:
   a. Manual Door Closers: 10 year warranty
   b. Exit Devices: 3 year warranty
   c. Warranty Period for Locks: 7 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. To the greatest extent possible, furnish all finish hardware of a specific item from only one manufacturer. All numbers and symbols used in the preparation of the following schedule have been taken from the current catalogs of the following manufacturers. **See 2.03.A this section for Owner required cores.**

1. Butts: HAGER.
2. Locksets and Latchsets: BEST, SCHLAGE.
3. Trim: ROCKWOOD.
4. Stops and Holders: ROCKWOOD.
5. Closers: DORMA, LCN.
6. Thresholds, Gaskets, Sweeps and Automatic Door Bottoms: HAGER, NATIONAL GUARD.
7. Exit Devices: DORMA, VON DUPRIN.
8. Flush Bolts: ROCKWOOD
9. Overhead Door Stops: GLYNN-JOHNSON.

B. Other Manufacturers: Hardware of the same types, weight and function, approved by Architect, and as manufactured by the following manufacturers may be bid; except NO SUBSTITUTIONS unless pre-approved by the Owner on the following:

1. Butts: STANLEY, McKINNEY.
2. Locksets and Latchsets: CORBIN-RUSSWIN, SARGENT.
3. Trim: BROOKLINE, HAGER, IVES.
4. Stops and Holders: GLYNN JOHNSON, IVES, HAGER.
5. Closers: NORTON.
6. Thresholds, Gaskets, Sweeps and Automatic Door Bottoms: PEMKO, REESE.
7. Exit Devices: PRECISION.
8. Flush Bolts: BALDWIN, IVES.
9. Overhead Door Stops: RIXSON, ABH.

2.02 MATERIALS AND COMPONENTS

A. Criteria Schedule: The standard type, function, finish and quality set forth in the hardware schedule is as follows:

B. Locksets and Latchsets: SCHLAGE L Series, 03A (lever) design. 626 finish.

1. Mortise locksets shall have an anti-friction latchbolt. One piece latchbolts are unacceptable.
2. Mortise locksets shall have sectional lever trim of the design and type as listed in the schedule.
3. Provide inside lever handle secured in place by a dowel screw and outside lever handle (secure side) pinned to the spindle.

C. Exit Devices: VD 99 Series

1. All exit devices shall be of one manufacturer.
2. Exit devices shall be furnished non-handed and capable of direct field conversion for all available trim functions.
3. Exit devices shall be UL listed for Accident Hazard. Fire exit devices shall carry an A label for the following products and maximum dimensions listed below:
   a. Rim and Mortise Exit Devices:
      4'-0" x 8'-0" single doors

8'-0" x 8'-0" pairs of doors

b. Surface and Concealed Vertical Rod Exit Devices
   4'-0" x 10'-0" single doors
   8'-0" x 10'-0" pairs of doors

c. Wood Door Concealed Vertical Rod Exit Devices
   4'-0" x 9'-3" single doors
   8'-0" x 9'-3" pairs of doors

4. Design: Push through type touch pad design with a straight or horizontal motion to eliminate pinch points.
5. Latch bolt shall have a self-lubricating coating that reduces friction and wear. Plated latch bolts are unacceptable.
6. Surface and concealed vertical rod exit devices: Incorporate a latch retraction feature, which shall hold both the top and bottom latchbolts in the retracted position while the door is open. Pullman latches or bottom latchbolt retraction only are not acceptable.
7. Finish: 626 .

D. Butts: Standard weight, five-knuckle, wrought steel or bronze. Pins in non-ferrous butts to be stainless steel and plain steel in all ferrous hinges. Provide all pins of non-rising type with a hole through the plug to facilitate pin removal. Provide all hinges with Phillips head screws.

1. All hinges on outswinging exterior doors [and doors located in Natatorium] shall be bronze base metal. Interior hinges shall be steel base metal, unless otherwise indicated.
2. Provide non-removable pin (NRP) feature on exterior outswinging doors and where specified.
3. 626 finish.
4. Provide ball-bearing type hinges on all doors with closers.
5. Hinge Sizes: Unless otherwise listed in Hardware Sets, provide the following:
   a. Doors Up to 3'-0" Wide: 4-1/2"h x 4-1/2"w.
   b. Doors Over 3'-0" Wide: 5"h x 4-1/2"w.

E. Door Closers: LCN 4011/4111

1. All door closers shall be the product of one manufacturer.
2. Shell: Cast iron or cast aluminum.
3. Full rack-and-pinion type.
4. Closer piston and spring bores shall be minimum 1-1/2" in diameter. Closer with smaller bores are not acceptable.
5. Closers shall be controlled by two springs: a main spring and a booster spring. Door closers having only one spring shall not be acceptable.
6. Provide closers with multi size spring power adjustment within the following ranges:
   a. Exterior Doors: sizes 2 through 6.
   b. Interior Doors: sizes 1 through 4.
   c. Fire Doors: sizes 2 through 6.
7. Provide closers with two non-critical valves, hex-key-adjusted, to independently regulate sweep and latch speed. Closers shall have

backcheck cushioning and backcheck positioning controlled by a hex-key valve. All adjusting valves shall be zinc or brass, accessible from the front of the door closer. No plastic adjusting valves shall be permitted.

8. Closers shall be packaged with arms, shoes, and accessories for regular arm, top jamb, and parallel arm mounting installations.
9. Regular arm and top jamb mounted door closers shall have a non-hold-open shoe permitting a 15% (+/- 7-1/2%) power adjustment.
10. Finish: Shop paint; color as selected by Architect.
11. Additional Door Closer Clarifications
    a. Closer Delay: Provide closers such that the sweep period from a 70 degree open position to 3" from the latch will not take less than 3 seconds, per ADA 4.13.10.
    b. Door Opening Force: Provide interior doors with a maximum opening force of 5 LBF per ADA 4.13.11.

F. Wall Stops: ROCKWOOD 409. Provide wall mounted type on all doors. Where wall types are not applicable, provide overhead stops. Check at site for proper type after doors are hung and as approved by Architect. 626 or 630 finish.

G. Overhead Stops and Holders: GJ #1 Series

1. Provide channels and slide members manufactured from brass, bronze or stainless steel. No plastic slide members permitted.
2. End caps for channels shall be manufactured from steel. Plastic end caps are not acceptable.
3. Operation: Engage and release door automatically by roller cam action with provision for a control knob at the bottom of the channel to engage or disengage hold-open action.

H. Fasteners

1. Manufacture hardware to conform to published templates; generally prepared for machine screw installation.
2. Furnish screws for installation, with each hardware item. Provide Phillips flat head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match the hardware finish, or if exposed in surfaces of other work, to match the finish of such other work as closely as possible.
3. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard manufactured units of the type specified are available with concealed fasteners.

I. Kick Plate: 8" high by 1-1/2" less than width of door, 1" less than width of pair of doors; .050" thickness. 630 finish.

J. Thresholds: NATIONAL GUARD 513; aluminum, maximum 1/2" high, with stainless steel fasteners. Conform to ANSI 117.1 and ADA Requirements.

K. Weatherstripping: NATIONAL GUARD 110N; extruded aluminum with neoprene insert.

L. Automatic Door Bottom: Surface mounted, neoprene seal with extruded aluminum housing. NATIONAL GUARD 420.

M. Rubber Silencers: Furnish as required for hollow metal frames. 3 per each single door, 2 per each leaf of each pair of doors.

N. Sweeps: NATIONAL GUARD 198N. Aluminum retainer with neoprene sweep.

O. Flush Bolts: ROCKWOOD 555 (HM) 557 (wood); 12” rod length; 1-3/4” thick door and 1880 dust proof strike.

P. Coordinator: ROCKWOOD 1600 Series. Non-handed type; provide with matching filler to fill opening width. Field paint to match hollow metal door frame. Provide with mounting brackets.

Q. Roller Catch: ROCKWOOD 592; adjustable type; with strike.

R. Push Plate: ROCKWOOD 70E x 16; 6” x 16” x .050”; bevel edges and square corners. 630 finish.

S. Pull/Plate: ROCKWOOD 107 x 70C; 4” x 16” plate with 3/4” round x 8-3/4” pull. 630 finish.

2.03 KEYING

A. Match Owner's existing keying system. Provide Best Lock IC cores (no substitute).

B. Final keying requirements shall be determined by the owner or the owner's agent in a meeting with the hardware supplier for the project.

C. An Architectural Hardware Consultant shall be available to assist the owner in making final keying decisions for the project.

D. Allow for 150% expansion of the keying system for any future additions, and provide with capacity for the project and the expansion mentioned above.

E. Provide a construction masterkey system to be used during the construction phase of the project.

F. All grand master and master keys shall be sent directly to the owner, via registered mail.

G. Furnish the following number of keys:

1. Construction keys: 12 total.
2. Change keys: 3 per lock.
3. Grand master keys: 5 total.
4. Master keys: 10 total.

2.04 HARDWARE SETS

A. General

1. Quantities listed under each hardware set number are for each door or pair of doors.
2. This schedule is intended to indicate the general quality and type of hardware required for the particular opening listed, but such description or schedule shall not be construed to denote that no other items of hardware will be required for the project.

B. Hardware Sets

1. The hardware schedule is itemized at the end of this section.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mount hardware units at heights recommended by DHI "Recommended Locations for Builders Hardware".

B. Install hardware in strict compliance with manufacturer's instructions. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as required for proper installation and operation.

1. Install mortised items flush with surface of doors and frames.
2. Install locksets, exit devices, door closers, and trim after painting is completed.

C. Upon completion, properly tag and identify keys and deliver to the owner or the owner's agent.

D. Closers

1. Exterior Doors: Install on interior side.
2. Corridor Doors: Install on room side not visible from corridors, lobbies and other public spaces.

E. Door Stops: Install wall mounted type or overhead mounted type as required on swing doors to limit travel and avoid damage to trim or adjacent wall.

F. Thresholds: Install on all exterior doors; include even if not indicated on door schedule or hardware sets. Install in bed of sealant on both legs of threshold.

G. Weatherstripping: Install on head and jambs of all exterior hollow metal doors; include even if not indicated on door schedule or hardware sets.

H. Sweeps: Install on all exterior hollow metal doors; include even if not indicated on door schedule or hardware sets.

I. Kickplates: Install on push side of door centered horizontally and one inch from bottom of door. Install on both sides of door where scheduled.

3.02 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of each unit. Lubricate moving parts with type of lubricant recommended by manufacturer. Replace units that cannot be adjusted or lubricated to operate freely and smoothly.

1. Adjust door closers for proper and smooth operation. All barrier-free closers shall be adjusted to meet the required opening force criteria.

B. Make final adjustment cleaning and lubricating, just before occupancy. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Instruct Owner's designated personnel in proper adjustment and maintenance of hardware and hardware finishes during final adjustment of units.

3.03 HARDWARE SCHEDULE

A. The minimum standards for quality of material and fabrication of all components are outlined in 1.03 Quality Assurance and Part 2 Products.

B. The hardware schedule (prepared by the Architectural Hardware Consultant listed below) has determine the minimum grade level of quality of materials for all project specific conditions, locations, intended use and finish:

David Scott, AHC/CDT
McCarthy Jones and Woodard, LLC
650 Southgate Avenue
Nashville, TN 37203

SCHEDULE

Refer to Section 01 23 00 for Alternate No. 1; and coordinate with the drawings for the base bid and alternate scopes of work.

Manufacturers:

Hager:	(1)
Schlage:	(2)
LCN:	(3)
Von Duprin:	(4)
Best:	(5)

BASE BID

Set 1

Door 100.1, 100.6

Each to receive:

6 Hinges BB1191 4 ½ x 4 ½ NRP 26D	(1)
2 Rim Panics 99L-996L 03A 626	(4)
1 Hardware Mullion KR4954	(4)
3 Cylinders	(5)
2 Closers 4111 CUSH TBWMS AL	(3)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
2 Sets Weatherstrip 891V 36” x 84” AL	(1)
1 Threshold 520SN 72” AL	(1)
2 Door Bottoms 789SW 36” AL	(1)
1 Rain Drip 810S 76” AL	(1)

Set 2

Door 100.2, 100.5, 108.3

All hardware by door supplier

Set 3

Door 100.3, 100.4, 101.1, 108.2, 109.3, 109.4

Each to receive:

3 Hinges BB1191 4 ½ x 4 ½ NRP 26D	(1)
1 Rim Panic 99L-996L 03A 626	(4)
1 Cylinder	(5)
2 Closers 4111 CUSH TBWMS AL	(3)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Set Weatherstrip 891V 36” x 84” AL	(1)
1 Threshold 520SN 36” AL	(1)
1 Door Bottom 789SW 36” AL	(1)
1 Rain Drip 810S 40” AL	(1)

Set 4

Not Used

Set 5

Door 101.2

Each to receive:

6 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
2 Rim Panics 99L-996L 03A 626	(4)
1 Hardware Mullion KR4954	(4)
3 Cylinders	(5)
2 Closers 4111 TBWMS AL	(3)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
2 Wall Stops 236W 32D	(1)

Set 6

Door 102.1, 103.1

Each to receive:

3 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Push Plate 30S 4 x 16 32D	(1)
1 Pull Plate 36N 4 x 16 32D	(1)
1 Closer 4111 TBWMS AL	(3)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Wall Stop 236W 32D	(1)

Set 7

Door 104.1, 105.1

Each to receive:

3 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Classroom Lock L9070 03A 626	(2)
1 Cylinder	(5)
1 Closer 4111 TBWMS AL	(3)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Wall Stop 236W 32D	(1)

Set 8

Door 106.1

Each to receive:

6 Hinges BB1191 4 ½ x 4 ½ NRP 26D	(1)
1 Mortise Storeroom Lock L9080 03A 626	(2)
1 Cylinder	(5)
2 Flush Bolts 282D 26D	(1)

2 Closers 4111 CUSH TBWMS AL	(3)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
1 Set Weatherstrip 891V 72” x 84” AL	(1)
1 Threshold 541SN 72” AL	(1)
1 Rain Drip 810S 76” AL	(1)

Set 9

Door 107.1, 100A.2

Each to receive:

3 Hinges BB1191 4 ½ x 4 ½ NRP 26D	(1)
1 Mortise Storeroom Lock L9080 03A 626	(2)
1 Cylinder	(5)
1 Closer 4111 CUSH TBWMS AL	(3)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Set Weatherstrip 891V 36” x 84” AL	(1)
1 Threshold 541SN 36” AL	(1)
1 Rain Drip 810S 40” AL	(1)

Set 10

Door 108.1, 109.1, 109.2

Each to receive:

6 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Classroom Lock L9070 03A 626	(2)
1 Cylinder	(5)
2 Flush Bolts 282D 26D	(1)
2 Closers 4111 CUSH TBWMS AL	(3)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
2 Wall Stops 236W 32D	(1)

Set 11

Door 106.2 OMITTED

ALTERNATE No. 1

Set 12

Door 114.1, 115.1

Each to receive:

3 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Entry Lock L9050 03A 626	(2)
1 Cylinder	(5)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Wall Stop 236W 32D	(1)

Set 13

Door 118.1

Each to receive:

3 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Classroom Lock L9070 03A 626	(2)
1 Cylinder	(5)
1 Kickplate 190S 8” x 2” LDW 32D	(1)
1 Wall Stop 236W 32D	(1)

Set 14

Door 116.1, 117.1

Each to receive:

6 Hinges BB1279 4 ½ x 4 ½ 26D	(1)
1 Mortise Classroom Lock L9070 03A 626	(2)
1 Cylinder	(5)
1 Dummy L0172 03A 626	(2)
2 Flush Bolts 282D 26D	(1)
2 Kickplates 190S 8” x 1” LDW 32D	(1)
2 Wall Stops 236W 32D	(1)

END OF SECTION

SECTION 08 81 00

GLASS GLAZING

PART 1 GENERAL

1.01 SCOPE

A. Work Included: Provide glass and glazing for all interior and exterior openings.

B. Work Not Included: Glass and glazing not provided under this Section are as follows:

1. Framed Mirrors: Section 10 28 13.

1.02 RELATED SECTIONS

A. Glazing in Aluminum Framing: Section 08 41 13.

1.03 QUALITY ASSURANCE

A. Glazing Installation Methods: Comply with Flat Glass Marketing Association (FGMA) "Glazing Manual".

B. Installation: Performed only by experienced glaziers.

C. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

1. ANSI: American National Standards Institute.
2. ASTM: American Society for Testing and Materials.
3. GANA: Glass Association of North America.
4. IGMA: Insulated Glass Manufacturers Alliance.

D. Safety Glass Standards: ANSI Z97.1.

1.03 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of glass, glazing sealants and accessories required.

B. Submit insulating and laminated glass manufacturer's certification indicating units meet or exceed specified requirements.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle glazing materials in accordance with manufacturer's recommendations to prevent damage and deterioration.

1.05 PROJECT CONDITIONS

A. Field verify measurements and conditions of installations.

B. Examine all details. Provide proper fitting for details indicated.

C. Do not perform work under adverse weather or job site conditions. Install liquid sealants when temperatures are within lower or middle third of temperature range recommendations by manufacturer.

D. Protect work from damage during and after installation until project acceptance.

1.06 WARRANTY

A. Insulating Glass: Submit manufacturer's written warranty that for ten years from date of substantial completion, a replacement will be provided (furnished and installed) for any unit which develops edge separation, thermal stress cracks, or other defects which materially obstruct vision through the glass or affect thermal and physical integrity of insulating glass units, except warranty shall not cover glass breakage from other than natural causes. Defective units shall be replaced at no additional cost to the Owner.

B. Coated Glass: Submit manufacturer's written warranty that for five (5) years from date of substantial completion, a replacement will be provided for defective units. Defects are defined as peeling, cracking or deterioration in coating due to normal conditions and not due to handling or installation contrary to glass manufacturer's published instructions. Defective units shall be replaced at no additional cost to the Owner.

C. Mirror: Submit manufacturer's five (5) year warranty against silver spoilage. A replacement will be provided for mirrors that develop visible defects. Defective units shall be replaced at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 GLASS

A. General: New, bearing manufacturer's label.

B. Acceptable Manufacturers and Fabricators: Specifications herein are based on glass and materials manufactured or fabricated by the following manufacturers. Not all firms listed manufacture or fabricate all the items specified herein. However, to ensure consistent quality of appearance and performance, provide each type or kind of glass or material from a single source. Manufacturers for specialty products are listed within the specification to establish a particular type, color, pattern, etc. Equal products by the manufacturers listed are acceptable providing they meet the type, color, pattern, etc. as approved by the Architect.

1. AGC FLAT GLASS NORTH AMERICA
2. VIRACON
3. PPG
4. GUARDIAN INDUSTRIES
5. INTERPANE
6. ACH FLOAT GLASS
7. OLDCASTLE GLASS

C. Type

1. Float or Plate
   a. General: Transparent window glass.
   b. Conformance: Type I, Class 1, Quality q3, conforming to ASTM C1036.
   c. Thickness: 1/4 inch.
   d. Color: Clear
2. Tempered
   a. General: Transparent safety glass.
   b. Conformance; Kind FT, Condition A, Type I, Class 1, , conforming to ASTM C1048.
   c. Thickness: 1/4 inch.
   d. Color: Clear
3. Insulating Glass - Type 1
   a. Type: Two thicknesses of tempered glass conforming to requirements stated hereinbefore.
   b. Color: Clear, both panes.
   c. Thickness: 1/4 inch each pane.
   d. Air Space: 1/2 inch.
   e. Unit Thickness: 1 inch.
   f. Thermal Conductance (U-Value): 0.56 maximum.

D. Fabrication

1. Tempered
   a. Provide treated glass strengthened to not less than 4 to 5 times annealed glass strength.
   b. Cut glass to required size before tempering. Comply with glass tempering recommendation.
2. Insulating Glass: Manufacturer's standard double pane glazed insulating glass construction, separated by a spacer, hermetically sealed with Class A sealant-type edge construction; dry air of glass filled air space with minus 20 degrees F., dew point.
   a. Fabricate insulating glass units meeting certification requirements of ASTM E774 as performed by IGCC for a Class A rating. Provide units IGCC labeled.
   b. Edge Construction: Twin primary seals of polyisobutylene; welded or soldered sealed corners, and filled with desiccant; and secondary seal outside of bar, bonded to both sheets of glass and bar, or hyposulfite, silicone or halogenate butyl elastomeric sealant.

c. Warranty: Provide manufacturer's standard ten year product warranty on maintained hermetic seal.

2.02 GLAZING MATERIALS AND ACCESSORIES

A. Glazing Sealants and Compounds

1. Comply with manufacturer's recommendations for selection of hardness. Select materials and variations or modifications for compatibility with surfaces contacted in the installation.
2. One part silicone rubber glazing sealant, complying with ASTM C920, Class A, non-sag. Provide acid type recommended by manufacturer; where one or more porous bond surfaces are contacted.
3. Preformed Butyl Rubber Glazing Sealant: Compound of polymerized butyl rubber and inert fillers, with or without polyisobutylene modification, solvent based, 95% solids, formed and coiled on release paper, tack-free in 24 hours, paintable, non-staining, plain preshimmed or reinforced as required for proper installation and setting of glass.

B. Miscellaneous Glazing Materials:

1. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
2. Setting Blocks: Neoprene or EPDM, 70-90 durometer hardness, with proven compatibility with sealants used.
3. Spacers: Neoprene or EPDM, 40-50 durometer hardness with proven compatibility with sealants used.
4. Compressible Filler (Rod): Closed cell or waterproof jacketed rod stock of synthetic rubber or plastic form, compatible space with sealants used, flexible and resilient, with 5-10 psi compression strength for 25% deflection.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, substructure and installation conditions. Do not proceed with glazing work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Protect glass from edge damage at all times during and after installation. Do not cut, seam, nip or abrade tempered glass.

B. Inspect each piece of glass immediately before installation and eliminate any which have observable edge damage or face imperfections.

C. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw, and bow oriented in same direction as other pieces.

D. Clean glazing channels and other framing members to receive glass immediately before glazing. Remove loose coatings. Apply primer to joint surfaces receiving sealants when recommended by sealant manufacturer.

3.03 INSTALLATION

A. Comply with combined recommendations and technical reports of manufacturer's of glass and glazing materials used with GANA "Glazing Manual", except when more stringent requirements are indicated.

B. Install insulating units to comply with recommendations by IGMA, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

C. Glazing channel dimensions shown are intended to provide for necessary bite on glass, minimum edge clearance and adequate sealant thickness, with reasonable tolerance. Adjust as required by job conditions at time of installation.

D. Install setting blocks of proper size at quarter points of sill rabbet. Provide spacers as required.

E. Install sealants, tapes, and gaskets in accordance with manufacturer's recommendations. Set glass without springing and install securely to prevent rattling or breakage.

F. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

G. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, to eliminate dirt and moisture pockets.

H. Clean and trim excess glazing materials from glass and stops or frames promptly after installation to prevent stains and discolorations.

3.04 FIELD QUALITY CONTROL

A. Watertight and airtight installation of exterior glass and glazing required. Each installation shall withstand normal temperature changes, wind loading, impact loading (for operating doors) without failure including loss or breakage of glass, failure of sealants of gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.

B. Repair glazing installation at leaks or, if leakage is excessive, replace glazing sealants and gaskets as directed.

3.05 PROTECTION AND CLEANING

A. Protect glass from breakage immediately upon installation by attachment of streamers to framing held away from glass. Do not apply markers of any type to surfaces of glass. Remove non-permanent labels and clean surfaces.

B. Maintain glass in a reasonable clean condition during construction so that it will not be damaged by corrosive action, and will not contribute (by wash off) to the deterioration of glazing materials and other work. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents and vandalism.

C. Wash and polish on both faces not more than four days before acceptance of the work. Comply with glass manufacturer's recommendations for final cleaning.

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD SYSTEMS

PART 1 GENERAL

1.01 SCOPE

A. Provide gypsum board systems consisting of wall board and framing as indicated and specified. Work includes:

1. Gypsum drywall wall systems.
2. Suspended drywall ceilings and soffits including suspension framing system.
3. Fire-rated gypsum drywall construction where indicated.
4. Exterior gypsum board sheathing.
5. Edge trim, corner beads, control joints, accent reveals, fasteners, joint treatment materials and other accessories required for a complete installation.
6. Includes installation of acoustical insulation specified in Section 07 21 00.

1.02 RELATED SECTIONS

A. Acoustical Panel Ceilings: Section 09 51 13.

B. Acoustical Insulation: Section 07 21 00.

1.03 QUALITY ASSURANCE

A. Gypsum Board Systems: Comply with ASTM C840 "Application and Finishing of Gypsum Board", and as specified.

B. Metal Framing System: Comply with ASTM C754 "Installation of Steel Framing Members to Receive Screw Attached Gypsum", and as specified.

C. Reference Standards: Wherever the following abbreviations are used herein they shall refer to the corresponding standard:

1. ASTM: American Society for Testing and Materials.
2. GA: Gypsum Association.

D. Fire-Rated Construction: Comply with fire resistance ratings indicated on drawings and as required by governing authorities and codes. Provide materials, accessories and application procedures that have been listed by Underwriters Laboratories or tested in accordance with ASTM E119 for the type of construction shown.

E. Guarantee: Submit written guarantee stating that cracks, delaminations or other imperfections in the drywall work which may develop within a period of 2 years from

date of acceptance will be repaired at no cost to the Owner.

F. Pre-Installation Conference: Conduct a pre-installation conference at Project site to review manufacturer's recommendations and referenced requirements for locating control joints in gypsum board walls and ceilings a minimum of one (1) week prior to beginning this portion of the Work. Have manufacturer's representative, contractor's representative and Architect present at this meeting. Conduct this conference to comply with requirements as outlined in Section 01 31 19, Project Meetings.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each gypsum board system component.

B. Submit manufacturer's certification that fire-rated assemblies proposed meet project requirements, including evidence of approved test reports acceptable to governing building code enforcing authorities, that assemblies when installed with proposed materials, will meet or exceed fire ratings required.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened labeled containers.

B. Store, protect and handle materials in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration. Protect cold-formed metal framing from corrosion, deformation and other damage during delivery, storage and handing per requirements of AISI's "Code of Standard Practice".

1. Protect adjoining surfaces against damage and soiling.

1.06 JOB CONDITIONS

A. Coordinate installation sequencing with work of other trades.

1. Verify completion of other work, including that of other trades, which will be concealed by gypsum drywall construction before installation of wallboard.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Gypsum Board: U.S. GYPSUM CO.; CELOTEX CORP.; FLINTKOTE CO.; GEORGIA-PACIFIC CORP.; GOLD BOND BUILDING PRODUCTS; DOMTAR GYPSUM.

B. Studs, Framing and Furring: DIETRICH; MARINO/WARE; CLARKWESTERN BUILDING SYSTEMS; STATE BUILDING PRODUCTS; gypsum board

manufacturers listed above.

C. Others as listed for specific products.

2.02 STEEL STUDS

A. Type: Screw type "C" shape, roll formed sheet steel members conforming to requirements of ASTM C645.

1. Material: ASTM A653 steel with minimum yield strength of 33 ksi.
2. Finish: Hot-dip galvanized coating, complying with ASTM A653 G40.
3. Gage and Width
   a. 25 gage x 3-5/8": Up to and including 14'-6" high.
   b. 20 gage x 3-5/8"
      1) Over 14'-6" up to and including 16'-5" high
      2) At wall mounted cabinet locations
      3) At walls receiving ceramic tile
   c. 20 gage x 4": Over 16'-5" up to and including 17'-6" high
   d. 20 gage x 6": Over 17'-6" up to and including 24'-0".
   e. 16 gage at door jambs, heavy equipment locations, and interior partitions receiving masonry veneer.
   f. Provide other gages or widths as indicated on drawings.
4. Thickness: Nominal 1-1/4".

B. Runners and Tracks: Designed and sized to receive studs. Gage to match studs except deflection tracks.

1. Ceiling Deflection Track: Provide one of the following:
   a. #53 FlexTrack, 20 gage typical, by SUPERIOR METAL TRIM PRODUCTS
   b. 20 gage top track with 2” minimum legs and 20 gage Spazzer 9200 Stud Spacer Bar by Dietrich Metal Framing
   c. Slip Track (Slp Trk) by BRADY CONSTRUCTION INOVATIONS
   d. The System by METAL-LITE
   e. The Three Legged Dog by FLEX-ABILITY CONCEPTS.
   f. A double slip track, 20 gage, can be used in lieu of the proprietary deflection tracks specified above. Legs of tracks shall be minimum 2".

C. Backing Plates (Blocking): Steel sheet for blocking; width to fit framing spacing; height to be 6” unless otherwise indicated.

1. Base Metal Thickness: Minimum 0.0598”.

D. Special Corner Plates: 20 gage galvanized sheet metal break metal; 5” x 5” x continuous length; one-piece. Provide at corner where studs cannot fill corners (i.e. 60 degrees corners, etc.).

2.03 CEILING/SOFFIT SUSPENSION SYSTEM

A. Provide the following materials unless otherwise indicated on the drawings. Metals used in exterior or areas subjected to moisture to be hot-dipped galvanized in accordance with ASTM A653 or A123 as applicable.

1. Main Runners: Cold-rolled steel channels; not less than 16 gage; G-90 galvanized finish for exterior and moist areas, black asphaltum painted for other areas. Spacing as required, but not to exceed 48" o.c.
   a. 1-1/2" deep where structural support framing is at 48" o.c. or less.
   b. 2" deep where structural support framing is over 48" and less than 66" o.c.
2. Cross Furring
   a. Cold-rolled steel channels, not less than 16-gage; 3/4" size; same finish as main runners.
   b. Hat shape, 7/8" deep, 25-gage. ASTM A653 G-60 hot-dipped galvanized.
   c. 2-1/2" x 20-gage, G-60 galvanized steel studs. Provide for multiple layer applications. Provide 12" long nested studs at suspension points.
3. Wire: Stainless steel 304 alloy for exterior conditions; galvanized soft annealed steel wire for interior conditions. Galvanized coating to meet or exceed Fed. Spec. QQ-W-461, Class 1.
   a. Tie Wire: Minimum 16-gage.
   b. Hanger Wire: Minimum 8-gage.

B. Optional Framing: At contractor's option, proprietary furring system may be used in lieu of black iron system for dry interior conditions without fire-rated requirements.

1. Description: System consisting of furring runners, furring tees, cross tees and hanger wires, designed and manufactured specifically for suspending gypsum board ceiling.
   a. Non-fire rated.
   b. Electrogalvanized, cold-rolled steel, 0.020" thick.
   c. Double web members; 1-1/2" high with 1-3/8" capped face.
2. Manufacturer: 640 System by CHICAGO METALLIC CORP.; Drywall Suspension System by USG, WORTHINGTON STEEL COMPANY, Watercheck LaFARGE GYPSUM.
3. Reference: ASTM C635, heavy duty.

2.04 METAL FURRING

A. Type: Galvanized steel, hat-section channel, unless otherwise indicated; 7/8" furring depth by 1-1/4" face width.

B. Manufacturer: DIETRICH Type FCE equal by CLARKWESTERN BUILDING SYSTEMS, MARINO/WARE, or by other gypsum board manufacturers listed in 2.01A.

C. Reference: ASTM C645.

2.05 GYPSUM BOARD

A. General: Comply with ASTM C1396.

B. Fire Rated Board: Type “C” or "X" (special fire retardant) to meet fire ratings for construction shown. Tapered edges. Thickness 5/8" unless otherwise indicated. Use at all locations indicated as meeting a specific fire resistance rating.

C. Moisture and Mold Resistant

1. ASTM C1396 (Section 5), regular type except where Type X fire-resistant type is indicated or required to meet UL assembly types.
2. Edges: Tapered.
3. Thickness: 5/8 inch, unless otherwise indicated.
4. Acceptable products: Mold Tough and Mold Tough Firecode (Type X) by USG; DensArmor Plus and DensArmor Plus Firecode (Type X) by GEORGIA-PACIFIC or equal by other gypsum board manufacturers listed in 2.01A.
5. Water Absorption: ASTM C473, the average water absorption for panels is not greater than 5 percent by weight after two-hour immersion.
6. Resistance to Mold Growth: ASTM D3273, “Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber,” the panel score was 10.
7. Use on non-ceramic tiled walls, ceilings and soffits in toilet rooms, shower rooms and drying rooms; on ceramic tiled non-wet walls in toilet rooms; walls and partitions above ceilings

D. Exterior Sheathing Board: Use for exterior sheathing and other areas where indicated on drawings. Provide in conformance with ASTM C1177, water repellent treated core and fiberglass face sheets. Dens-Glas by GEORGIA-PACIFIC or GlasRoc by BPB. 5/8" thickness unless otherwise indicated.

E. Impact Resistant Gypsum Wallboard: ASTM C1396 and ASTM C1278, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels, with core type and in thickness indicated, and with long edges tapered. Provide where indicated.

1. Minimum Physical Properties:
   a. Thickness: 5/8 inch.
   b. Screw Withdrawal (lbg): .104.
   c. Flexural Strength (lbf): 200.
   d. Fire Hazard Classification: Flame spread 5, smoke developed 0.
   e. Surface Abrasion (ASTM D4977: 25 pound weight, 50 cycles): 0.090 inch.
   f. Surface indentation (ASTM D5420): 0.14 inch.
   g. Soft Body Impact (ASTM E695)
      1) Surface Failure: 175 feet – pounds.
      2) Deformation Failure: 225 feet – pounds.
      3) Structural Failure: Greater than 300 feet – pounds.
2. Manufacturers: VHI Fiberock by USG, Hi-Impact 1000 by NATIONAL GYPSUM COMPANY, Tough Rock by GEORGIA PACIFIC or equal by

other gypsum board manufacturers listed in 2.01A.

F. Standard Board: 5/8" thick unless otherwise indicated. Tapered edges. Use at all locations except those indicated to receive a specific type of board.

G. Gypsum Liner Board: ASTM C442, Type X, 1" thick gypsum core with moisture resistant faces.

H. Tile Backer Board: See Section 09 30 00.

2.06 ACCESSORIES

A. Fasteners: Drywall screws and metal framing screws per manufacturer's instructions and recommendations for type and size, based on construction and conditions involved.

B. Trim

1. Corner Beads - Outside, Square Corners: 1-1/4 inch x 1-1/4 inch heavy gauge galvanized steel or vinyl, perforated.
   a. Metal: BEADEX MANUFACTURING; DIETRICH METAL FRAMING; CLARKWESTERN BUILDING SYSTEMS; listed gypsum board manufacturers
   b. Vinyl: VINYL TECH; VINYL CORP.
2. Corner Beads - Outside, Non-square Corners: BEADEX B-1 Splay Flexible Corner or equal. Concealed metal; two galvanized continuous strips laminated with paper trim; for application without mechanical fasteners.
3. Exposed Edges (Casing Beads): L-shaped trim, size to suit wallboard. J-shaped bead not permitted.
   a. Metal: DIETRICH METAL FRAMING M20B; BEADEX; DALE INDUSTRIES; listed gypsum board manufacturers.
   b. Vinyl: VINYL CORP. SB; VINYL TECH.
4. Control Joints
   a. Metal: Roll formed zinc, tape protected 1/4" wide x 7/16" deep control slot. DIETRICH No. 093; BEADEX; DALE INDUSTRIES; listed gypsum board manufacturers.
   b. Vinyl: VINYL CORP. No. CVJ-16; VINYL TECH. Tape protected 3/16" wide x 7/16: deep control slot.

C. Reinforcing Tape: Width to adequately cover joint.

D. Joint Taping Compound: Designed for bonding tape to wallboard and coating corner beads and fasteners.

1. Exterior Exposure: Type as recommended by board manufacturer.
2. Toxicity/IEQ: Lime compound. All purpose joint compound containing inert fillers and natural binders. Pre-mixed compounds shall be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds

E. Joint Topping Compound: Designed to sand smooth and feather well for finished

surface.

1. Exterior Exposure: Type as recommended by board manufacturer.
2. Toxicity/IEQ: Lime compound. All purpose joint compound containing inert fillers and natural binders. Pre-mixed compounds shall be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds

F. Additional Item: All additional accessories to complete work including nails and anchors to secure frames to walls and floors.

G. Acoustic Materials
1. Insulation: See Section 07 21 00.
2. Sealant: See Section 07 92 00.

PART 3 EXECUTION

3.01 GENERAL

A. Metal Furring and Framing: Comply with the requirements of ASTM C754 "Installation of Steel Framing Members to Receive Screw Attached Gypsum", and as specified.

B. Gypsum Board Systems: Comply with ASTM C840 "Application and Finishing of Gypsum Board", and as specified.

3.02 PREPARATION

A. Maintain uniform building temperature range not less than 55 degrees F., for 24 hours before, during and after gypsum panel installation and joint finishing treatment.

B. Provide adequate lighting and ventilation during installation and joint finishing treatment.

3.03 INSPECTION

A. Examine substrates and installation conditions. Do not proceed with gypsum wallboard work until unsatisfactory conditions have been corrected.

1. Protrusions of framing, twisted framing members, or unaligned members must be repaired before installation of wallboard is started.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.04 FRAMING INSTALLATION

A. Securely attach runner to floor with expansion anchors or other approved means.

B. Install all framing plumb and square with spacing as indicated.

C. Provide supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Company's "Gypsum Construction Handbook".

D. Bridging
   1. Up to 10 ft. Wall Height: 1 row.
   2. 10 ft. and Over Wall Height: 2 rows of bridging.

E. Provide a minimum of two (2) screws per connection.

F. Rated Stud Deflection Assembly: Install in accordance with manufacturer's instructions to provide required fire ratings. Ensure that anchoring devices, back-up material, clip supports and other materials are as used in referenced fire tests.

3.05 FURRING INSTALLATION

A. Ceiling Application: Install suspension system for ceilings and soffits, both interior and exterior, in accordance with manufacturer's instructions, shop drawings and as follows:

   1. Locate furring runners at 48" on center with hanger wires at 48" on center. Attach hanger wires to structural framing members specifically for this purpose. Attach hanger wires to framing wires using attachment devices whose suitability has been demonstrated by standard construction practice or by certified test data.
   2. Connect furring runners with furring tees spaced at 24" on center. Locate additional tees or hanger support as required for surface mounted and recessed ceiling and soffit items such as light fixtures, diffusers, etc. Add additional hanger wires as required to support all such items at each corner.
   3. Provide wall track wherever suspension meets a vertical surface.
   4. Brace suspension system for exterior ceilings and soffits to structure above to resist wind up-lift using metal channels or metal studs. Install after system is completely suspended to level plane.
   5. Do not support ceiling system from ductwork, electrical conduit, heating or plumbing lines, and vice versa. Each utility system and the ceiling system shall be a separate installation and each shall be independently supported from the building structure.
      a. If an interference occurs, provide trapeze type hangers or other suitable supports for each system. Locate hangers where they will not interfere with access to mixing boxes, fire dampers, valves and other appurtenances requiring servicing.

3.06 GYPSUM BOARD INSTALLATION

A. General

1. Pre-installation Conference: Before start of gypsum board installation, meet at the project site with the Architect and installers of related work, including work requiring openings, chases, frames, access panels, support, similar integrated requirements and mechanical and electrical trades. Review potential interferences and conflicts and coordinate layout and sequencing requirements for proper installation and integration of the work.
   a. Do not proceed with gypsum board installation until blocking, framing, bracing and other supports for subsequently applied work have been installed, reviewed and accepted by the Architect.
   b. Do not install gypsum board until work concealed by gypsum board has been installed.

B. Application

1. Install gypsum board face side out. Do not install imperfect, damaged or damp boards.
2. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.
3. Locate either edges or end joints over supports. Position boards so that both tapered edge joints abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
4. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.
5. Floating Construction: Install gypsum board with "floating" internal corner construction, unless isolation of the intersecting board is indicated.
6. In addition to compliance with the standards, comply with specific requirements indicated for each type of arrangement of gypsum wallboard system shown. Space fasteners in accordance with manufacturer's recommendations and complying with referenced standards.
   a. Walls and Partitions: Apply sheets horizontally or vertically. Provide maximum sheet lengths to minimize end joints with edges or ends over supports. In two layer applications, stagger joints of second layer from joints of first layer.
   b. Cut and install panels to eliminate vertical joints in corners of door frames to ceiling.
   c. Make cutouts to fit within wall plate, register and grille flanged. All cutouts made by knife or saw.
   d. Make angles and corners clean, true, plumb and square; walls plumb, flat and straight and ceilings flat and level.
   e. Ceilings: Apply gypsum board on ceilings, before application on walls and partitions. Install in direction and manner to minimize end joints. Stagger end joints over supports. In two layer applications, stagger joints of second layer from joints of first layer.

C. Direct-Glue Application

1. Apply gypsum vertically with closely butted joints within 10 minutes after application of mastic adhesive, sooner if recommended by manufacturer of adhesive. Apply firm hand pressure over entire board to effect a bond and to level board. Use slight sliding movement to position board. Shim drywall 1/4" off floor.
2. Apply mastic adhesive in amounts and at locations on board as recommended by adhesive manufacturer. Provide temporary fasteners or bracing as recommended until adhesive sets.

3.07 INSTALLATION OF SOUND RATED PARTITIONS

A. Provide sound-rated construction where indicated.

B. Acoustic Insulation: Install single layer of acoustic batt insulation in designated partitions after one side of gypsum board is installed, filling width and height of partition completely. Attach to gypsum board with adhesive spots to prevent subsequent displacement.

C. Extend partition stud system through acoustical ceilings to substrate. Apply gypsum board base panels full height, both sides of partition.

D. Seal partition perimeters. Provide continuous beads of acoustical sealant at juncture of both faces of runners or plates with floor and ceiling construction and wherever work abuts dissimilar materials. Seal prior to installation of sound attenuation insulation and gypsum board panels.

E. Provide continuous beads of sealant at juncture of gypsum board and abutting surface. Install gypsum board with 1/8" relief for sealant. Sealants to be contained within depth of gypsum board, not as a fillet.

F. At openings and cutouts, fill open spaces between edges of gypsum board and fixtures, cabinets, ducts, and other flush or penetrating items, with continuous bead of acoustical sealant.

G. If sound-rated partitions intersect non-sound-rated partitions, extend sound construction to completely close-off sound flanking paths through non-rated construction. Seal joints between face layers at vertical interior angles of intersecting partitions.

H. Exercise particular care at walls surrounding toilet areas and walls and ceilings surrounding mechanical spaces to provide properly constructed sound-rated gypsum board partition and ceiling systems.

I. Verify that electrical boxes are not located back-to-back; back-to back boxes to be offset at least one stud space. Do not close off non-complying conditions before notifying and receiving direction from Architect.

3.08 TRIM AND ACCESSORIES

A. Install corner beads at external corners of gypsum wallboard work. Use longest practical lengths.

B. Install edge trim wherever edge of gypsum board would be exposed or semi-exposed.

1. Provide beaded trim to receive joint compound at all gypsum wallboard work.
2. Provide L-type trim where work is abutted to other work and Kerf-type where work is kerfed to receive kerf leg.
3. Provide U-type trim where edge is exposed, revealed, gasketed or sealant filled, including expansion joints.

C. Attach to framing with screws. Clinch attachment to wallboard not acceptable.

D. Control Joints

1. Install control joints to isolate gypsum board surfaces as recommended by ASTM C840. Verify locations with Architect prior to installation. Generally locate joints as follows when:
   a. Partition, furring or column fireproofing abuts a structural element (except floor) or dissimilar wall or ceiling.
   b. Ceiling abuts a structural element, dissimilar wall or partition or other vertical penetration.
   c. Construction changes within the plane of the partition or ceiling.
   d. Partition or furring run exceeds 30'.
   e. Ceiling dimensions exceed 50' in either direction with perimeter relief; 30' without relief.
   f. Exterior ceilings and soffits exceed 20' in either direction; align with window mullions, when applicable.
   g. Wings of "L", "U", and "T"-shaped ceiling areas are joined.
   h. Expansion or control joints occur in the base exterior wall.
   i. Differential Deflection Conditions: All locations where partitions are supported by two or more structural members and subject to differential deflection by live or dead loading:
      1) Typical Framing Floor to Structure: Provide "Ceiling Deflection Track".
      2) Framing over One Floor (stairs, shafts, etc.): Provide control joints where studs are interrupted by structure.
2. Provide framing immediately on both sides of joint and back with 2"+/- gypsum board strips as required to maintain fire resistance rating.

3.09 FINISHING

A. Comply with manufacturer's instructions for mixing, handling and application of materials. Apply treatment at joints both directions, at flanges of trim accessories, penetrations of gypsum board (electrical boxes, piping and similar work), fastener heads, surface defects and elsewhere indicated. Apply in manner that will result in each of these items being concealed when applied decoration has been completed.

B. Prefill open joints of more than 1/16" with special chemical-hardening type bedding

compound, before bedding joint tape.

C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

D. Do not use topping compound for bedding joint tape.

E. Apply joint compound for the final coat of joint treatment, unless specifically recommended by the manufacturer for that use.

F. Walls Above Acoustical Ceiling Systems: Tape and fill joints with two coats of joint compound, sanding not required.

G. Leave all exposed surfaces smooth and even, ready for painting.

H. Provide where indicated on the drawings levels of finish as specified in ASTM C840, "Recommended Specification on Levels of Gypsum Board Finish". Levels of finish consist of:

1. Level 1 - **Areas Above Ceilings**: All joints and interior angles shall have tape embedded in joint compound. Provide surface free of excess joint compound. Tool marks and ridges are acceptable.
2. Level 2 – **As a Substrate for Ceramic Tile**: All joints and interior angles to have tape embedded in joint compound and one separate coat of joint compound applied over all joints, angles, fastener heads, and accessories. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
3. Level 4 – **All Areas Not Indicated to Receive Levels 1, 2 or 5**: All joints and interior angles to have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. All joint compound shall be smooth and free of tool marks and ridges.
4. Level 5 – **All Areas to Receive Semi-Gloss or Gloss Coatings**: All joints and interior angles to have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface. Excess material is to be removed leaving a film covering over the gypsum board paper surface.

3.10 ADJUST AND CLEAN

A. Remove any screw which does not engage into a framing member or spins freely.

B. When paper face is punctured, drive new screw approximately 1-1/2" from defective fastener and remove defective fastener. Fill damaged surface with compound.

C. Ridging

1. Do not repair ridging until condition has fully developed: approximately 6

months after installation or one heating season.

2. Sand ridges to reinforcing tape without cutting through tape.
3. Fill concave areas on both sides of ridge with topping compound.
4. After fill is dry, blend in topping compound over repaired area.

D. Fill cracks with compound and finish smooth and flush.

END OF SECTION

SECTION 09 30 00

TILE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Extent of tile work is shown on drawings and schedules, and as specified herein.

B. Types of tile work required including the following:

1. Ceramic wall tile, floor tile and base.
2. Backer board.

1.02 RELATED SECTIONS

A. Sealant: Section 07 92 00.

B. Concrete slab preparation: Section 01 73 00.

1.03 QUALITY ASSURANCE

A. Manufacturer: Provide tile of each type produced by a single manufacturer. Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

B. Installer: A firm with not less than 5 years experience in installing tile in applications similar to those required for this work.

C. Ceramic Tile Manufacturing Standard: TCA 137.1. Furnish tile complying with Standard Grade requirements unless indicated otherwise.

D. Proprietary Materials: Handle, store, mix and apply proprietary setting and grouting materials in compliance with manufacturer's instructions.

E. Installer to verify locations of all flexible joints required by the provisions of this section, by the recommendations of TCA, and by the recommendations of the related manufacturers. See Article 3.06.

1. Joint locations may not be indicated on the drawings.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical information and installation instructions for materials required. Include certifications and other data to show compliance with these specifications.

B. Samples: Submit manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors available, for each type of tile specified. Include samples of grout and accessories requiring color selection. Submit full size sample for each type of trim, accessory and color. Submit samples of metal edge strip.

C. Certification: Furnish Master Grade Certificate for each type of tile, signed by manufacturer and Installer.

1.05 PRODUCT HANDLING

A. Deliver packaged materials and store in original containers with seals unbroken and labels intact until time of use, in accordance with manufacturer's instructions.

1.06 JOB CONDITIONS

A. Maintain environmental conditions and protect work during and after installation in accordance with referenced standards and manufacturer's printed recommendations.

PART 2 PRODUCTS

2.01 CERAMIC TILE

A. Wall Tile, Floor Tile and Base: Cushion edge, standard grade, impervious porcelain ceramic tile conforming to ANSI 137.1. Provide trim pieces as required.

1. Walls: 6" x 6", glazed.
   a. Colors: Minimum of 2 colors per room will be used.
   b. Color Layout (Patterns): As indicated or as directed by Architect.
2. Floors: 12" x 12", unglazed. Provide abrasive grain for slip resistance.
   a. Colors: Minimum of 2 colors per room will be used.
   b. Color Layout (Patterns): As indicated or as directed by Architect.
3. Base: Provide 4" high, porcelain ceramic tile, cove base with square top, for meeting wall tile and bullnose top at terminations. Base pieces to be of length to match wall tile, or multiples of wall tile. Provide inside and outside corners and trim pieces as required.
   a. Color and finish to match wall tile as selected by Architect.
4. Manufacturer: Provide ceramic floor tile, wall tile and base as manufactured by one of the following subject to the above requirements.
   a. BUCHTAL.
   b. AMERICAN OLEAN TILE.
   c. DAL-TILE CORPORATION.
   d. MID-STATE TILE COMPANY.
   e. MONARCH TILE COMPANY.

   An unacceptable pattern or color match is reason for disapproval of product and manufacturer. No substitutions will be considered after bid opening.

2.02 MORTAR, GROUT AND ACCESSORIES

A. See Tile Installation Systems in Part 3 of this Section. Setting mortar and grout to be from same manufacturer.

B. Latex-Portland Cement Setting Mortar - Thin Set: Factory mixed mortar of Portland cement/sand, field gauged with undiluted latex admixture. Conform to ANSI A118.4, Latex-Portland Cement Mortar.

1. Provide one of the following:
   a. BOSTIK, Durabond D-50 or D-60.
   b. TEC (H.B. FULLER), Fullflex.
   c. MAPEI, Kerabond or Keralastic.
   d. LATICRETE, 255 MultiMax.

C. Dry-Set Mortar - Thin Set: Mixture of Portland cement with sand and latex, water imparting additive. Conform to ANSI A118.2, Conductive Dry-Set Portland Cement Mortar.

1. May be used in lieu of Latex-Portland Cement Setting Mortar for ceramic floor and wall tile.

D. Grout - Ceramic Tile: Integrally colored, sanded, non-staining, latex Portland cement, factory prepared (premixed) grouts gauged with undiluted latex additive. Color as selected by Architect.

1. Provide one of the following:
   a. BOSTIC, Hydroment.
   b. TEC (H.B. FULLER), AccuColor.
   c. MAPEI, Keracolor.
   d. LATICRETE, Grout.
2. Latex Additive: Liquid latex polyacrylate. Provide one of the following or equal by manufacturers listed above:
   a. MAPEI, Plastijoint
   b. TEC (H.B. FULLER), Grout Additive #TA869
   c. Similar types by BOSTIC or LATICRETE.

E. Membrane Waterproofing: Provide one of the following:

1. One component trowel applied elastomeric waterproofing membrane. Manufacturer's published literature must include statement that material allows for substrate movement of up to L/240. Hydroment Ultra-Set by BOSTIC or equal product by NATIONAL APPLIED CONSTRUCTION PRODUCTS, INC., TEC (H.B. FULLER) or CUSTOM BUILDING PRODUCTS that meet the specified requirements.
   a. Provide mat or tape accessories as recommended by waterproofing manufacturer to treat slab cracks and expansion joints.
2. Double coat, trowel applied, two-component material with 6 ounce fiber mesh reinforcing and sheet membrane for detail work at transitions in plane. Sheet membrane to be recommended and approved by waterproofing manufacturer for use in their system. Planicrete W Heavy-

Duty Double Coat System by MAPEI or equal products by CUSTOM BUILDING PRODUCTS, TEC (H.B. FULLER) or LATICRETE INTERNATIONAL INC.

F. Crack Isolation

1. Description: Minimum 40 mil, self-adhering membrane.
2. Manufacturer: 9235 Anti-Fracture Membrane by LATICRETE; ECB Antifracture Membrane by NAC PRODUCTS Composeal Gold by COMPOTITE CORPORATION; Nobleseal CIS by THE NOBLE COMPANY, TA139 Anti-Fracture Membrane by TEC (H.B. FULLER).

G. Metal Edge Trim: Provide type and depth trim as indicated. Provide in locations indicated. Also provide at control joints, between floor tile and dissimilar material and where thresholds do not occur. Except as otherwise indicated, where trim is located across door openings, locate trim on the door side in line with the edge of the door stop, terminating at the rabbet. Provide stainless steel products.

1. Manufacturer: SCHLUTER, CERAMIC TOOL COMPANY, BLANKE. Styles as indicated or required by substrate conditions.

2.03 TILE BACKER BOARD

A. Description: Nominal 1/2" thick cementitious board with fiberglass mesh reinforcements conforming to the requirements of ANSI A118.9..

1. Provide cadmium plated screws, type as recommended by board manufacturer.
2. Joint Treatment Tape: 2" wide, 10x10 glass mesh type or similar type as recommended by board manufacturer.

B. Manufacturer: Wonder Board by MODULARS, INC.; Util-A-Crete by FIN PAN; Durock Interior Tile Backer Board by U.S. GYPSUM; Dens-Shield by GEORGIA PACIFIC.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine surfaces to receive tile, setting beds and accessories before tile installation for the following:

1. Defects or conditions adversely affecting quality and execution of the installation.
2. Deviations beyond allowable tolerances of surfaces to receive tile.
3. Do not proceed with installation work until unsatisfactory conditions are corrected.

B. Conditions of surfaces to receive tile.

1. Surfaces to be firm, dry, clean, and free of oily or waxy films or curing compounds.
2. Grounds, anchors, plugs, hangers, bucks, electrical, plumbing and HVAC work in or behind tile to be installed prior to proceeding with tile work.

3.02 PREPARATION

A. Prepare surfaces to receive tile as required to achieve proper bond and as recommended by the Tile Council of America.

1. See Section 01 73 00 for additional floor preparation requirements.

B. Fill cracks, low areas and pits in concrete with self-leveling fill of type recommended by tile manufacturer for substrate conditions encountered.

C. When required, lightly grind concrete subfloors with a terrazzo grinder to remove trowel marks or other surface irregularities which will telegraph to the flooring surface.

D. Sawcut or grind transition areas as required to install tile as indicated.

E. Clean surfaces in a manner suitable for proper installation. Verify that slabs are free of curing membranes, oil, grease, wax, dust and other materials deleterious to tile installation.

F. Primers or other preparations required or recommended in accordance with manufacturer's instructions.

3.03 TILE BACKERBOARD

A. Location: Provide tile backerboard on metal stud walls as a substrate for ceramic tile products specified herein which are located on toilet room wet walls and other areas where indicated.

B. Install in strict accordance with manufacturer's recommendations and ANSI A108.11, Interior Installation of Cementitious Backer Units.

1. Butt ends and edges of adjacent panels.
2. Attach with screws spaced at 6 inch centers on perimeter and field.
   a. Maintain minimum 1/2 inch from screws to panel edge.
   b. At wainscot or similar location where tile terminates in same plane of wall, shim tile backerboard flush with adjacent wall board. Provide shims continuous along face of studs.
3. Locate control and expansion joints in same locations as substrate and where required by wall tile.
4. Apply glass mesh tape, or type recommended by board manufacturer, over joints. Embed tape in setting material indicated for specified tile finish.

3.04 WALL TILE INSTALLATION - SYSTEMS

A. Prepare surfaces, fit, set or bond, grout, and clean in accordance with Tile Council of America, "Handbook for Ceramic Tile Installation", 2008 Edition; and as follows:

B. Interior Stud Walls - Over Tile Backerboard: TCA W244, dry-set mortar bond coat or latex Portland cement bond coat and grout.

1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.
3. Backerboard
   a. Joint Preparation: Fill joints completely with setting mortar and embed 2 inch wide coated fiberglass tape into skim coat of same mortar.
   b. Apply setting mortar in one layer, troweling skim coat with trowel's flat edge and then texturing with appropriate notched trowel. Troweling equipment must be appropriate for type of tile work and in good condition.

C. Interior Stud Walls - Over Gypsum Board: TCA W243, dry-set mortar bond coat or latex Portland cement bond coat and grout.

1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.

3.05 FLOOR TILE INSTALLATION - SYSTEMS

A. Prepare surfaces, fit, set or bond, grout, and clean in accordance with Tile Council of America, "Handbook for Ceramic Tile Installation", 2008 Edition; and as follows:

B. Interior Floor - Thin Set, Waterproof Membrane: TCA Design F122, waterproofing, latex Portland cement bond coat and grout.

1. Install in strict conformance with waterproofing membrane manufacturer's written instructions and recommendations.
2. Tile: ANSI A108.5.
3. Grout: ANSI A108.10.

C. Interior Floor - Thin Set, Without Waterproof Membrane: TCA design F113, latex Portland cement mortar and grout or dry-set mortar and grout.

1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.

3.06 TILE INSTALLATION - PROCEDURES

A. Anti-Fracture Membrane: Install over floor cracks. Discontinue at control and expansion joints. Install in compliance with manufacturer’s instructions and shop drawings. Seam joints as recommended by manufacturer.

B. Extend tile work into recesses and under or behind equipment and fixtures, to form

a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars or covers overlap tile.

D. Placement Methods: Install tile using the hereinbefore specified setting beds and grouts.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting.

1. Avoid tile layout with less than half width tiles at room/area perimeters, unless otherwise indicated on the floor layout drawings. Notify Construction Manager if layout not achievable per layout indicated on the drawings. Do not continue in room/area in question until approved by the Associate.
2. Provide uniform joint widths, unless otherwise shown.
   a. Provide 1/4” joints for large format ceramic tile.

3.06 FLEXIBLE JOINTS

A. Locate flexible joints (expansion, control and isolation joints) prior to tile installation. See Quality Assurance in Part 1 herein.

B. Provide flexible joints as specified herein, unless more stringent requirements are indicated on drawings. Provide as specified, regardless if not indicated on drawings.

C. Joint to be continuous from face of tile to bottom of setting bed or leveling bed. Reinforcing to be discontinued at joint. Install continuous joint filler material in joint from setting or leveling bed to a point below face of tile adequate for proper placement of backing rod and sealant.

D. Joint Design: TCA design EJ171 as applicable. See Section 07 92 00 for sealant. Provide at the following locations:

1. Horizontal Surfaces
   a. Directly over joints in structural floor, including cold joints, construction joints, control joints, and expansion joints.
   b. Where tile work abuts restraining surfaces such as perimeter walls, curbs, columns, pipes, etc.
   c. Floor areas exceeding 24 feet in any direction.
   d. Where indicated.
2. Vertical Surfaces

a. Directly over joints in wall substrate including cold joints, construction joints, control joints and expansion joints.
b. At changes in substrate material.
c. Where tile work abuts restraining surfaces such as perimeter walls, curbs, columns, pipes, etc.
d. Where indicated.

E. Curing: Cure tile floor, base, and wall installations in accordance with manufacturer's recommendations, TCA recommendations, and in accordance with ANSI requirements.

F. Metal Edge Strips: Provide metal edge strips at openings without thresholds, and where exposed edges of tile floors meet other materials.

3.07 REPAIR, CLEAN AND PROTECT

A. Repair, or remove and replace chipped, damaged or otherwise defective work to the satisfaction of the Architect.

B. Cleaning: Upon completion of placement and grouting, clean all tile surfaces so that they are free of foreign matter.

1. Use methods and materials as recommended by tile manufacturer.
2. Replace tiles that cannot be satisfactorily cleaned.

C. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent damage and wear.

1. Prohibit foot and wheel traffic from using tiled floors for at least 3 days after grouting is completed.
2. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide acoustical lay-in panel ceiling system as shown and specified.

1.02 RELATED SECTIONS

A. Gypsum Board Ceiling: Section 09 21 16.

1.03 QUALITY ASSURANCE

A. Workmanship: Comply with Ceilings & Interior Systems Contractors Association (CISCA) Code of Practices.

B. Installation: Performed by an experienced authorized installer approved by acoustical material manufacturer.

C. Fire Hazard Classification: Provide acoustical materials which have been UL tested, listed and labeled Class 0-25, when tested in accordance with ASTM E84, Class A flame spread rating in accordance with ASTM E1264 requirements.

D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standards.

1. AIMA: Acoustical and Insulating Materials Association.
2. ASTM: American Society for Testing and Materials.
3. CISCA: Ceilings and Interior Systems Contractors Association.

E. Coordination Between Trades: Quality assurance includes the cooperation with HVAC, Plumbing and Electrical Contractors in regards to ceiling grid layout.

1. Procedures for submitting coordination drawings for ceiling work is included in Section 01 33 23 - Shop Drawings, Product Data and Samples.

1.04 SUBMITTALS

A. Product Data

1. Submit manufacturer's product data and installation instructions for each type of acoustical material and suspension system required.

2. Submit manufacturer's written instructions for recommended maintenance practices for each type of acoustical ceiling system required. Include

recommendations for cleaning and refinishing acoustical units and precautions against materials and methods that may be detrimental to finishes and acoustical performances.

B. Samples: Submit 12" square acoustical panel samples for each type of acoustical unit required. Provide 12" long suspension system and edge molding samples.

C. Certification: Submit manufacturer's certification of acoustical units fire hazard classification rating and performance requirements.

D. Maintenance Materials: Provide 2% each type and color of acoustical material supplied for replacement and maintenance purposes. Provide full size units, matching units installed, in properly labeled unopened or resealed boxes.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unopened protective packaging, with manufacturer's labels indicating brand name, pattern size, thickness and fire rating as applicable, legible and intact.

B. Store materials in original protective packaging to prevent soiling, physical damage or wetting.

C. Store cartons open at each end to stabilize moisture content and temperature.

D. Do not begin installation until sufficient materials to complete a room are received.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Pressurized Plenums (to comply with CISCA's recommendations for cleaning duct system and protecting ceiling units in pressurized plenums from damage and soiling caused by blowing dirt and dust that may be present when duct system is first operated): Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 PRODUCTS

2.01 SUSPENSION SYSTEM

A. Exposed "Tee" Grid System

1. Description: Cold-rolled electrogalvanized steel, factory applied white finish. SA-1: 15/16” exposed face; DONN (USG INTERIORS) Model DX; CHICAGO METALLIC 200 Snap Grid System; ARMSTRONG Prelude.

2. Description: Comply with ASTM C635. Provide systems adequate to support light fixtures, ceiling diffusers, and other normal accessories. Maximum deflection 1/360 of the span. All components of system from one manufacturer, die cut, and interlocking.
   a. Structural Class: Intermediate duty.
   b. Type of System: Direct Hung.
   c. Attachment Devices: Size for five times design load indicated in ASTM C635, Table 1 direct hung.
   d. Hanger Wires: ASTM A641 galvanized carbon steel, soft temper, prestretched not less than 12 gauge.
   e. Carrying Channels: 1-1/2" steel channels, hot-rolled or cold-rolled, not less than 0.475 lbs per linear foot, standard finish.
   f. Members: Provide manufacturer's standard exposed runners, cross runners and accessories of type and profiles indicated, with exposed cross runners coped to lay flush with main runners.
   g. Hold Down Clips: Manufacturer's standard; provide in areas not scheduled to receive retention clips.
   h. Retention Clips at Impact Resistant Ceiling: Manufacturer's standard retention clips designed and spaced to secure acoustical tiles in-place against vandalism in public areas.
3. Edge Moldings: Hemmed edge wall angles, cold-rolled electrogalvanized steel, factory applied finish to match grid system.

2.02 ACOUSTICAL UNITS

A. Acceptable Manufacturers: The following models listed are by ARMSTRONG. Equal products by CELOTEX or U.S. GYPSUM are acceptable.

B. Panel Types: Type SA-1: Cortega #769, 24” x 48”, square edge for 15/16” grid, NRC range .55, CAC 35, light reflectance LR-.82, with white.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, structure and installation conditions. Do not proceed with acoustical ceiling systems work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half widths units at borders.

B. Coordinate with ceiling layout on drawings.

C. Notify Architect of discrepancies between ceiling layout on drawings and ceiling layout proposed. Do not proceed until approved by Architect.

3.03 INSTALLATION

A. Suspension System: Comply with ASTM C636 requirements and be water or laser leveled, maximum deflection of 1/360 of span and maximum surface leveling tolerance 1/8" in 12'-0".

B. Rough Suspension

1. Hangers: Ceiling suspension systems shall not be supported from ductwork, electrical conduit, heating or plumbing lines or any other utility lines. Each utility and the ceiling suspension system shall be a separate installation and each shall be independently supported from the building structure. Where interferences occur, employ trapeze hangers or supports to avoid interferences with appurtenances requiring servicing. Support all four corners of suspension systems at fluorescent light fixtures.
2. Wall Molding
   a. Provide edge trim molding at perimeter of acoustical ceiling installation and intermediate vertical surfaces. Use maximum lengths. Miter trim corners to provide tight, accurate joint. Connect moldings securely to substrate surfaces.
   b. Connect moldings to substrate at intervals not over 16" on center and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0".
3. Hold-Down Clips: Provide on all panels adjacent to light fixtures.
[4. Retention Clips: Provide on all tiles in areas listed herein.]

C. Acoustical Units

1. Install acoustical lay-in panels level, in uniform plane, with joints snug and square and panels free from damage or soiling.
   a. Fit border units accurately at borders and penetrations.
   b. Recreate tegular and decorative edges at wall cuts and other cuts.
2. Coordinate suspension systems grid layout with electrical lighting fixture lay-out and installation.

3.04 CLEANING

A. After installation, clean soiled or discolored surfaces of acoustical units and exposed suspension members. Comply with manufacturer's recommendations for cleaning and touch-up of minor finish damage.

B. Adjust all sags and twists which develop in ceiling systems. Remove and replace units which are improperly installed and damaged units which cannot be successfully cleaned and repaired to eliminate evidence of damage.

END OF SECTION

SECTION 09 65 00

RESILIENT FLOORING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide resilient flooring as shown and specified. Work includes:

1. Vinyl composition tile flooring.
2. Base.
3. Adhesives and accessories to complete the work.

1.02 RELATED SECTIONS

A. Concrete slab preparation: Section 01 73 00.

1.03 QUALITY ASSURANCE

A. Provide each type of resilient flooring and base material produced by one manufacturer, including recommended adhesives and leveling compounds.

B. Provide each type resilient flooring and base material from same production run. Colors shall be uniform throughout.

C. Fire Test Performance: Provide materials complying with referenced standard fire tests.

1. ASTM E84 (Tunnel Test): Flame spread less than 75 (Class B).
2. ASTM E162: Flame spread less than 75 (Class B).
3. U.L. 992: Flame propagation index less than 2.0.

D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

1. ASTM: American Society for Testing and Materials.
2. FS: Federal Specifications as established by the U.S. Government, General Services Administration.
3. U.L.: Underwriter's Laboratories.
4. ADA: Americans with Disabilities Act Accessibility Guidelines.

E. Slip Retardant Performance: Unless a greater performance is specified under a specific product, all floor materials must have a minimum static coefficient of friction of 0.6.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of

resilient flooring, base and accessory required.

B. Samples

1. Tiles: Submit full sized samples of each type, color and pattern required to illustrate the full range of color variations.
2. Base: Provide 6" lengths of each type and color.

C. Submit manufacturer's certification that resilient flooring furnished complies with required fire test performance and has been tested and meets indicated requirements.

D. Submit manufacturer's written instructions for recommended maintenance practices for each type of resilient flooring, base and accessory material required.

E. Extra Stock: Furnish extra materials in the following quantities:

1. Tiles and Base: Furnish 2% of the total quantity (but not less than 2 full sealed cartons) of each type, pattern and color. Provide 5% of colors with less than 5000 square feet. Properly package and identify each material.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened labeled containers.

B. Store, protect, and handle resilient flooring materials in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration.

C. Store materials in areas to receive resilient flooring for a minimum of 48 hours before installation.

1.06 PROJECT CONDITIONS

A. Maintain uniform room temperature range not less than 70 degrees F., in areas to receive resilient flooring for minimum 48 hours before installation and 48 hours after installation.

B. Provide adequate lighting and ventilation during installation and clean-up.

C. Protect adjoining surfaces from damage and soiling.

PART 2 PRODUCTS

2.01 RESILIENT FLOORING MATERIALS

A. Vinyl Composition Tile: ASTM F1066, Class 1 or 2 as applicable, 12" x 12" x 1/8", manufactured without asbestos.

1. Colors, Patterns and Manufacturers

a. Basis of Design: Colors and types indicated on the drawings are based on ARMSTRONG.
b. Other Acceptable Manufacturers: Products manufactured by MANNINGTON or TARKETT are acceptable providing they meet the requirements specified herein and are an acceptable color match as approved by the Architect. Color match should be submitted to the Architect during bidding for inclusion by an Addendum.

B. Vinyl Base – Standard Type: Complying with ASTM F1861, Type TV, Group 2, 6" high, 1/8" gage. Provide long length rolls and job formed corners. Standard top set cove (Style B) at resilient and other hard surface flooring and straight toeless (Style A) at all carpeted floors. Base shall contain a minimum of 90 percent recycled material.

1. Colors and Manufacturers
a. Basis of Design: Colors and types indicated on the drawings are manufactured by JOHNSONITE.
b. Other Acceptable Manufacturers: Products manufactured by VINYL PLASTIC, INC. (VPI) or ROPPE are acceptable providing they meet the requirements specified herein and are an acceptable color match as approved by the Architect. Color match should be submitted to the Architect during bidding for inclusion by an Addendum.

2.02 ACCESSORIES

A. Concrete Slab Prime: Non-staining type, compatible with adhesive, as recommended by flooring manufacturer.

1. Moisture Emissions Sealer: Epoxy type similar to CHEMREX CX Concrete Floor Primer, SINAK Sealer P-105 or equal type specifically formulated for moisture emission control.

B. Leveling Compound: Non-staining latex modified, Portland cement based type, compatible with flooring, as provided or recommended by the flooring manufacturer.

C. Adhesives: Waterproof, stabilized type as recommended by the resilient flooring and base manufacturer to suit material and substrate conditions.

D. Resilient Edge Strips: 1/8" thick homogeneous vinyl or rubber composition, tapered or bullnose edge, color to match flooring, or as selected by Architect from standard colors; not less than 1" wide.

E. Cleaning and Polishing Materials: Polish and neutral cleaner as recommended by the floor material manufacturer.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates and installation condition. Do not proceed with resilient flooring work until unsatisfactory conditions have been corrected.

B. Subfloor surfaces shall be smooth, level, at the required finish elevation, and within the tolerances specified in Section 03 30 00.

C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Before installing flooring, vacuum clean substrate surfaces and inspect subfloor to verify that concrete slab complies with ASTM F710.

1. When required, lightly grind concrete subfloors with a terrazzo grinder to remove trowel marks or other surface irregularities that will telegraph to the flooring surface.
2. Fill cracks, low areas and pits in concrete with self-leveling fill of type recommended by flooring manufacturer for substrate conditions encountered.
3. Perform bond, alkalinity and moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured and are ready to receive flooring.
4. Moisture Testing
   a. Perform anhydrous calcium chloride test, ASTM F1869. Proceed with installation only after substrates have a maximum moisture vapor emission rate of 3 lbs. of water/1000 sq. ft. in 24 hours.
   b. Proceed with installation only after substrates pass testing.
   c. If after 120 days of slab placement moisture levels are not within the specified limits, apply floor primer as specified below.
5. Apply primer, if moisture emissions are greater than the specified amount or for other purposes as recommended by flooring manufacturer, before application of adhesive. Apply in compliance within manufacturer's recommended limits.

3.03 INSTALLATION

A. Install resilient flooring and accessories with adhesive in strict compliance with the manufacturer's recommendations. Butt tightly to vertical surfaces, thresholds, nosings and edgings. Scribe around obstructions and to produce neat joints, laid tight, even and straight. Extend flooring into toe spaces, door reveals and into closets and similar openings.

B. Tile Flooring

1. Lay tile flooring with joints tight, in true alignment and parallel to walls of rooms and corridors.
2. Lay tile symmetrically about centerlines of space, without pattern or

borders. Adjust layout to avoid use of cut widths less than one-half tile at room perimeter.

3. Match tile for color by using manufactured and packaged sequence.
4. Broken, cracked, or deformed tiles are not acceptable.
5. Immediately after installation, thoroughly roll tile with a 150 lb. sectional roller until a firm, uniform bond has been obtained.

C. Static Dissipative Tile Flooring: In addition to the above requirements, conform to ARMSTRONG Installation System Manual F-5061 or similar type recommended system by other approved manufacturer.

D. Base

1. Install at walls, column, casework and other permanent fixtures as scheduled. Install in as long of lengths as practicable. Tightly bond base to backing throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
2. Provide terminal base ends beveled and toes rounded.
3. On masonry surfaces or other similar irregular surface, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

E. Edge Strips: Place tightly butted to flooring and secure with adhesive. Install at edges of flooring which would otherwise be exposed.

3.04 CLEANING AND PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. After flooring has set, clean thoroughly. Remove excess adhesive or other surface blemishes from flooring, using neutral type cleaners as recommended by the flooring manufacturer.

C. Perform initial maintenance according to latest edition of manufacturer's maintenance manual and the following:

1. Vinyl composition Tile: Clean, apply polish, and buff with type of polish, number of coats and buffing procedures in accordance with manufacturer's instructions.

D. Protect installed flooring from damage and staining with heavy duty non-staining Kraft paper or other covering at all traffic lanes. Protect completed work from traffic and damage until final acceptance.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.01 SCOPE

A. Work Included

1. Surface preparation and painting or finishing of all interior and exterior exposed items and surfaces except as otherwise indicated. Work includes, but is not necessarily limited to, the following:
   a. Walls, ceilings and soffits of gypsum board.
   b. Concrete surfaces where indicated.
   c. Hollow metal doors and frames.
   d. Wood doors, frames, trim, casework and millwork as required.
   e. Exposed structure including deck and all framing.
   f. Exposed ferrous metal of any type, interior and exterior, including galvanized items.
   g. Exposed sheet metal, ductwork, conduit and piping in finished areas; not mechanical equipment or electrical equipment rooms.
   h. Exposed prime coated or unfinished mechanical or electrical items outside of mechanical equipment rooms. Repaint factory finished mechanical or electrical items where specified.
   i. Stenciling of fire walls above ceilings.
   j. Other items noted or specified.
2. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under other sections of the work.

B. Mechanical Equipment Rooms: Painting subject to the following requirements:

1. Paint finish on walls and ceiling, when scheduled on drawings, to be applied prior to installation of mechanical/electrical work as much as possible.
2. Spray painting not permitted after electric motors have been installed.

C. Work Excluded: Do not paint the following items unless specifically called for to be painted herein or where idicated on the drawings.

1. Prefinished items include the following factory-finished components:
   a. Architectural woodwork.
   b. Acoustical wall panels.
   c. Toilet enclosures.
   d. Finished mechanical and electrical equipment.
   e. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    a. Foundation spaces.
    b. Furred areas.
    c. Ceiling plenums.
    d. Pipe spaces.
    e. Duct shafts.
3. Finished metal surfaces include the following:
    a. Anodized aluminum.
    b. Stainless steel.
    c. Chromium plate.
    d. Copper and copper alloys.
    e. Bronze and brass.
4. Operating parts include moving parts of operating equipment and the following:
    a. Valve and damper operators.
    b. Linkages.
    c. Sensing devices.
    d. Motor and fan shafts.
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Surface Preparation

1. It is the intention of this specification that new substrates will be ready for decoration as specified herein except for normal construction dust and soiling.
2. Surfaces installed by other trades are required to be acceptable for work specified under Part 3, Surface Preparation. Specifically, surfaces to be clean, sound, free from loose particles, dirt, loose mortar and grease.

1.02 RELATED SECTIONS

A. Metal Building Finish requirements: Section 13 34 19.

1.03 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions; including rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures; includes installations within unheated shelters.

1.04 QUALITY ASSURANCE

A. Application: Performed only by skilled, experienced painters.

B. Provide lead free prime and finish coatings. All top coatings shall be mold and mildew resistant.

C. Coordination: Provide finish coats compatible with prime paints used. Review other specification sections to ensure compatibility of total coating system with prime paints provided for the various substrates. Provide barrier coats over non-compatible primers or remove primer and reprime as required. Notify the Architect of anticipated problems using coating systems specified on substrates primed in accordance with other section requirements.

D. Reference Specifications

1. The following Society for Protective Coatings (SSPC) specifications are referenced by code number within this Section.

Code	Method
SP-1	Solvent Cleaning
SP-2	Hand Tool Cleaning
SP-3	Power Tool Cleaning
SP-6	Commercial Blast Cleaning
SP-11	Power Tool Cleaning to Bare Metal

E. Job Mock-Ups: Provide only if required by the Owner. Mock-ups will serve as standard for acceptance of work. Leave approved mock-ups in place as part of completed project. Manufacturers' representatives shall be available to advise applicator on proper application techniques and procedures. Locate as directed.

F. Paint walls prior to installing wall mounted signage.

1.05 SUBMITTALS

A. Submit a complete selection of manufacturer's color chips indicating color, texture and sheen for approval for each finish specified herein.

B. Submit a complete schedule for identifying manufacturer and specific brand name or number of products proposed for finishing specified surfaces.
1. Provide percent of solids by volume content data for each paint material.
2. Provide paint label analysis and application instructions for each type paint.

C. Provide the following quantities of paint of each type and color required for maintenance purposes. Provide original, unopened, labeled containers with color samples and a list of project use. Extra materials are not to be used for touch-up by Contractor.

1. Metals and Wood: 2 gallons.
2. Gypsum Board: 5 gallons.

D. Color/Finish Samples

1. After receiving color chips from the Contractor, the Architect will provide a complete schedule of colors and sheens desired.
2. Obtain schedule well in advance of commencing work and submit samples of specified finishes for approval.
3. Submit duplicate samples on the same kind of materials to which finishes will be applied. One half of the sample shall show the completed treatment and the other half shall show the successive steps, taken in producing the finish. When approved, samples will be so marked; one set will be retained by the Architect and one set will be returned for the painter's use.
4. No finishes shall be applied on the work until samples are approved. Approved samples shall be strictly duplicated in the work. Additional coatings, if required to reproduce approved samples, shall be applied without additional cost to the Owner.
5. Use representative colors when preparing samples for Architect's review.

E. Statement From Manufacturer

1. Contractor, in submitting the list of proposed subcontractors, shall include for approval, along with the name of the painting subcontractor, the names of the manufacturers whose materials the subcontractor proposes to use in the work.
2. Following tentative approval of the subcontractor and the materials manufacturers, notify the manufacturers, in writing, that the specifications require the manufacturers to submit to the Architect, a statement by a corporate officer of the manufacturer that coatings scheduled by the Architect are proper for the intended use and that the manufacturer's representative will be available to advise the Architect and the Contractor regarding applications of all coatings.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials on the job site in original, new, unopened packages and containers bearing the manufacturer's name, label and the following information:
1. Name or title of material.
2. Manufacturer's stock number and date of manufacture.
3. Manufacturer's name.
4. Contents by volume, for major pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.

B. Store, protect and handle materials in accordance with manufacturer's recommendations to prevent damage and deterioration. Store paint materials at minimum of 50° F.

C. Maintain paint material storage space as clean, non-hazardous and orderly. Place waste and soiled paint rags in tightly covered metal containers; safely dispose of at end of each working day. Take every precaution to avoid fire hazards and spontaneous combustion. Provide acceptable type of fire extinguisher immediately adjacent to paint storage area.

1.07 PROJECT CONDITIONS

A. Coordinate painting and finishing work with other trades to ensure adequate illumination, ventilation and dust-free environment during application and drying of paint and finish treatments.

B. Maintain uniform interior building temperature of minimum 50° F for 24 hours before, during and continuously for 48 hours after painting.

C. Do not apply coatings when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Provide adequate ventilation as required for specified paint and finish treatment materials in spaces scheduled. Maintain for time periods recommended by material manufacturer to provide proper drying.

E. Provide adequate illumination on surfaces to be finished. Maintain a minimum 80 foot candle lighting level measured mid-height at substrate surface.

F. Protect adjoining surfaces against damage or soiling.

G. Maintain work in neat and orderly condition, promptly removing empty containers, wrappings, soiled rags, waste and rubbish from site.

H. Material Safety Data Sheets (MSDS): Provide documents available to Owner's Representative, Architect and construction personnel at the job site. Comply with MSDS requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Paint: Brands of paint and stain are specified only to establish a standard of quality and color (where applicable). Other paint brands and manufacturers such as BENJAMIN MOORE; ICI (DEVOE; GLIDDEN); MARTIN SENOUR; PPG; PRATT AND LAMBERT; PORTER; CORONADO PAINT COMPANY, SHERWIN WILLIAMS are acceptable upon proof of satisfactory experience records for the intended use.

2.02 MATERIAL QUALITY

A. Provide the best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying the manufacturer's identification as standard, best-grade product will not be acceptable.

B Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only to recommended limits.

C. Provide paints of durable and washable quality. Use paint materials that will withstand normal washing as required to remove pencil marks, ink, ordinary soil, etc., without showing discoloration, loss of gloss, staining or other damage.

D. Stains: Factory-mixed, penetrating, transparent oil-base type. Applicator shall be allowed to add approved colorants on the job to match approved samples. No other ingredients shall be added to stains.

2.03 ACCESSORY MATERIAL

A. Application Equipment: Not required to be new, but shall be adequate for the work and workmanship required herein.

B. Accessories: Provide all required ladders, scaffolding, drop cloths, masking, scrapers, tools, dusters and cleaning solvents as required to perform the work and achieve the results specified herein.

C. Secondary products not specified by name (i.e. turpentine, thinners, mineral spirits, fillers, linseed oils, etc.) shall be "best grade" or "first line" products.

1. Filler material shall be woodworker's option of material that can be tinted and worked so as to match adjacent wood surfaces.

2.04 EXTERIOR PAINT AND FINISH MATERIAL SCHEDULE

A. Apply paint and finish materials to substrate surfaces indicated. Apply touch-up prime coats in addition to shop-applied prime coats. Provide additional job site prime coats when indicated.

B. Metal – Ferrous: Galvanized and Shop Primed

1. SW
   a. Finish: S-W Metalatex Semi-Gloss Enamel B42 Series. Two (2) coats at minimum 2.0 mil dft per coat. 34% to 38% solids; VOC 125 g/L
2. PPG
   a. Primer: Pitt-Tech Interior/Exterior Primer DTM Industrial Enamel 90-712 Series. One (1) coat at minimum 2.0 mils dft. 37% to 41% solids; VOC 116 g/L.

b. Finish: Interior/Exterior Semi-Gloss Acrylic Metal Finish 7-374 Series. Two (2) coats at minimum 1.5 mils dft. 32% to 36% solids; VOC 77 g/L.

3. ICI DULUX
   a. Primer: Ultra-Hide Aquacrylic Gripper #3210 Series; One (1) coat at minimum 2.0 mils dft. 49% to 51% solids; VOC 95 g/L.
   b. Finish: Ultra-HideDurus Exterior Acrylic Semi-Gloss #2416 Series; Two (2) coats at minimum 1.5 mils dft. 40% to 42% solids; VOC 79 g/L.

C. Metal – Ferrous: Unprimed

1. SW
   a. Primer: DTM Acrylic Primer B66W1. One (1) coat at minimum 2.5 mil dft. 44% to 48% solids; VOC 138 g/L.
   b. Finish: S-W Metalatex Semi-Gloss Enamel B42 Series. Two (2) coats at minimum 2.0 mil dft per coat. 34% to 38% solids; VOC 125 g/L
2. PPG
   a. Primer: Pitt-Tech Interior/Exterior Primer DTM Industrial Enamel 90-712 Series. One (1) coat at minimum 2.0 mils dft. 37% to 41% solids; VOC 116 g/L.
   b. Finish: Interior/Exterior Semi-Gloss Acrylic Metal Finish 7-374 Series. Two (2) coats at minimum 1.5 mils dft. 32% to 36% solids; VOC 77 g/L.
3. ICI DULUX
   a. Primer: Devflex 4020 Direct to Metal Primer; One (1) coat at minimum 2.2 mils dft. 43% to 45% solids; VOC 91 g/L.
   b. Finish: Ultra-HideDurus Exterior Acrylic Semi-Gloss #2416 Series; Two (2) coats at minimum 1.5 mils dft. 40% to 42% solids; VOC 79 g/L.

2.05 INTERIOR PAINT AND FINISH MATERIALS SCHEDULE

A. Apply paint and finish materials to substrate surfaces indicated. Apply touch-up prime coats in addition to shop-applied prime coats. Provide additional job site prime coats when indicated.

B. Metal – Ferrous: Shop Primed/Unprimed

1. SW
   a. Primer: DTM Acrylic Primer B66W1. 2.5 mils dft. 46% solids; 138 g/L.
   b. Finish: Harmony Low Odor Interior Latex Semi-Gloss B10 Series. Two (2) coats at minimum 1.6 mil dft per coat. 38% to 42% volume solids; VOC 0 g/L.
2. PPG
   a. Primer: Pitt-Tech Interior/Exterior Primer DTM Industrial Enamel 90-712 Series. One (1) coat at minimum 2.0 mils dft. 37% to 41% solids; VOC 116 g/L.

b. Finish: Pure Performance Interior Semi-Gloss Latex 9-500 Series. Two (2) coats at minimum 1.3 mil dft per coat. 35% to 39% volume solids; VOC 0 g/L.

3. ICI DULUX
   a. Primer: Devflex 4020. One (1) coat at minimum 2.2 mil dft. 42% to 45% solids; VOC 91 g/L.
   b. Finish: 1406 Lifemaster Semi-gloss 2000 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
4. Surfaces: Hollow metal doors, frames, door mullions, railings, ferrous metal surfaces.

C. Metal – Ferrous: Galvanized

1. SW
   a. Primer: DTM Acrylic Primer B66W1. 2.5 mils dft. 46% solids; 138 g/L.
   b. Finish: Harmony Low Odor Interior Latex Semi-Gloss B10 Series. Two (2) coats at minimum 1.6 mil dft per coat. 38% to 42% volume solids; VOC 0 g/L.
2. PPG
   a. Primer: Pitt-Tech Interior/Exterior Primer DTM Industrial Enamel 90-712 Series. One (1) coat at minimum 2.0 mils dft. 37% to 41% solids; VOC 116 g/L.
   b. Finish: Pure Performance Interior Semi-Gloss Latex 9-500 Series. Two (2) coats at minimum 1.3 mil dft per coat. 35% to 39% volume solids; VOC 0 g/L.
3. ICI DULUX
   a. Primer: Ultra Hide Aquacrylic Gripper 3210. One (1) coat at minimum 1.4 mil dft. 49% to 51% solids; VOC 95 g/L.
   b. Finish: 1406 Lifemaster Semi-gloss 2000 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
4. Surfaces: Hollow metal doors, frames, door mullions, railings, ferrous metal surfaces.

D. Gypsum Board and Plaster– Ceilings/Soffits

1. SW
   a. Primer: Harmony Low Odor Interior Latex Primer B11W900. One (1) coat at 1.3 mils dft. 31% to 35% volume solids; VOC 0g/L.
   b. Finish: Harmony Low Odor Interior Latex Flat B5 Series. Two (2) coats at minimum 1.7 mil dft per coat. 40% to 44% volume solids; VOC 0 g/L.
2. PPG
   a. Primer: Pure Performance Interior Latex Primer 9-900 Series. One (1) coat at 1.4 mil dft. 34% to 38% solids; VOC 0 g/L.
   b. Finish: Pure Performance Interior Flat Latex 9-100 Series. Two (2) coats at minimum 1.6 mil dft per coat. 38% to 42% volume solids; VOC 0 g/L.

3. ICI DULUX
   a. Primer: 1080 Lifemaster 2000. One (1) coat at 1.4 mil dft. 34% to 38% solids; VOC 0 g/L.
   b. Finish: 1402 Lifemaster Flat 2000 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
4. Surfaces: Ceilings, bulkheads

E. Gypsum Board - Walls

1. SW
   a. Primer: Harmony Low Odor Interior Latex Primer B11W900. One (1) coat at 1.3 mils dft. 31% to 35% volume solids; VOC 0 g/L.
   b. Finish: Harmony Low Odor Interior Latex Eg-Shell B9 Series. Two (2) coats at minimum 1.6 mil dft per coat. 37% to 41% volume solids; VOC 0 g/L.
2. PPG
   a. Primer: Pure Performance Interior Latex Primer 9-900 Series. One (1) coat at 1.4 mil dft. 34% to 38% solids; VOC 0 g/L.
   b. Finish: Pure Performance Interior Eggshell Latex 9-300 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
3. ICI DULUX
   a. Primer: 1080 Lifemaster 2000. One (1) coat at 1.4 mil dft. 34% to 38% solids; VOC 0 g/L.
   b. Finish: 1402 Lifemaster Eg-Shell 2000 Series. Two (2) coats at minimum 1.5 mil dft per coat. 36% to 40% volume solids; VOC 0 g/L.
4. Surfaces: Gypsum board wall surfaces.

F. Exposed Structure - Ferrous (Eg-Shel): Dryfall

1. SW
   a. Primer: ProCryl Universal Primer, B66-310 Series (2-4 mils dft)
   b. Finish: Waterborne Acrylic Dry Fall, B42W2 Two coats at minimum 4.5 mils dft.
2. PPG
   a. Primer: Pitt-Tech Int/Ext Primer Finish DTM Industrial Enamel 90-712 (2.0 to 3.0 mils dft).
   b. Finish: Speedhide Interior Super Tech WB Acrylic Dry Fog Latex, 6-725 two coats at minimum 2.5 mil dft per coat.
3. ICI DULUX
   a. Primer: Spraymaster Pro Uni-Grip WB Acrylic Dryfall Eggshell Primer and Finish; 1 coat at minimum 1.5 mil dft;VOC 26 g/L.
   b. Finish: Spraymaster Pro Uni-Grip WB Acrylic Dryfall Eggshell Primer and Finish; 2 coats at minimum 2.0 mils dft per coat;VOC 26 g/L.
4. Surfaces: Exposed metal decking, trusses, structural steel, metal joists.

G. Exposed Structure - Galvanized (Flat): Dryfall

1. SW
   a. Finish: Waterborne Acrylic Dry Fall, B42W2 Two coats at minimum 2.5 mils dft per coat.
2. PPG
   a. Finish: Speedhide Interior Super Tech WB Acrylic Dry Fog Latex, 6-725 two coats at minimum 2.5 mil dft per coat.
3. ICI DULUX
   a. Finish: Spraymaster Pro Uni-Grip WB Acrylic Dryfall Semi-Gloss Primer and Finish; 2 coats at minimum 2.5 mils dft per coat;VOC 39 g/L.
4. Surfaces: Exposed metal decking, trusses, structural steel.

H. Interior Stain Schedule - Wood Trim

1. SW
   a. Stain: Minwax 250 VOC Stains: Colors as selected by Architect.
   b. Finish: Two coats S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series at 1.0 mil dft per coat.
2. PPG
   a. Stain: 250 VOC Stains: Colors as selected by Architect.
   b. Finish: Two coats REX Interior Acrylic Polyurethane Satin Finish 77-49, VOC 236 gal/L at minimum 1.0 mil dft per coat.
3. ICI
   a. Stain: 250 VOC Stains: Colors as selected by Architect.
   b. Finish: Woodpride Interior Waterborne Aquacrylic Satin Varnish, VOC 174 g/L. Two coats.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrate surfaces and installation condition. Report condition(s) that might affect proper application.

B. Do not proceed with painting work until unsatisfactory conditions have been corrected.

C. Initial application of paint to a surface constitutes acceptance of existing conditions and responsibility for satisfactory performance.

D. Examine specification sections of other trades and their provisions regarding painting. Surfaces left unfinished shall be painted or finished as part of the work of this Section unless specifically noted otherwise.

3.02 SURFACE PREPARATION

A. General

1. Broom clean and remove excess dust before painting is started in any area.
2. Broom cleaning is not permitted after operations have begun in a specific area.
3. Surfaces shall be clean, dry and adequately protected from dampness.
4. Surfaces shall be free of any foreign materials that will adversely affect adhesion or appearance of applied coating.
5. Remove any mildew and neutralize the surface prior to applying coating.

B. Concrete

1. Remove splatters, dust and dirt by brushing or water washing with clear water.
2. Remove misplaced mortar.
3. Cracks, abrasions and other defects shall be cut out, patched flush, and sanded smooth and sealed before applying prime coat.

C. Wood - Stained

1. Prime and backprime faces, edges and end with first coat before installation.
2. Sandpaper to smooth and even surface, dust off.
3. Countersink nails.
4. Putty all nail holes, cracks, open joints and other defects with mixture of stain and putty so that appearance of completed work is uniform. Sand smooth and dust off.

D. Structural Steel and Miscellaneous Ferrous Metal

1. Bare Metal Surfaces
   a. Remove grease, oil, dirt and other foreign material prior to prime coat application where necessary according to SP-1, SP-2 and/or SP-3.
   b. Remove rust prior to prime coat application according to SP-11.
   c. Include all hangers and miscellaneous fabricated items.
2. Shop Primed Surfaces
   a. Fill open joints or abrasions in shop prime coat with filler; feather edges, sand smooth, and touch-up with primer compatible with shop primer. Extend primer beyond treated area.
   b. Remove grease, oil, dirt and other foreign material prior to prime coat touch-up where necessary according to SP-1, SP-2 and/or SP-3.
   c. Include all hangers and miscellaneous fabricated items.

E. Galvanized or Zinc-Coated Items

1. Pretreat surfaces prior to application of prime coat with phosphate pretreatment, unless prime coat material to be used is recommended by its manufacturer for direct application over zinc treated surfaces of the type at hand. Follow manufacturer's directions.

2. Remove dirt or grease on surfaces scheduled for paint finish according to SP-1. Wipe dry with clean cloths.
3. Roughen surface with steel wool as necessary to remove gloss.

F. Gypsum Board

1. Fill minor irregularities with spackling paste.
2. Sand to smooth level surface and dust off.
3. Avoid raising nap of paper.

G. Factory Primed Items: Verify compatibility between factory applied primer and finish painting system. If compatibility cannot be guaranteed, then provide barrier coat compatible with both finishes.

H. Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces: Solvent clean in accordance with SSPC SP 1 and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants.

3.03 APPLICATION

A. General

1. Apply all paint in strict accordance with the manufacturer's instructions. Data sheets take precedence over these specifications if more restrictive, except for the minimum DFT specified in the schedule.
2. Do not apply until preceding coat is dry to manufacturer's recommendations.
3. Do not apply to any surface unless it is thoroughly dry.
4. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes if moisture content of surface is greater than recommended by manufacturer.
5. Do not use material that has exceeded the pot life stated by the manufacturer.
6. Apply to the following workmanship requirements:
   a. Neat appearance of finished surfaces.
   b. Absence of ridges, sags, runs, drops, laps, unnecessary brush marks, holidays, air bubbles and excessive roller stipple.
   c. Thorough mixing of paint and limited use of thinners.
   d. Uniformity of film thickness.
   e. Proper drying time between coats.
   f. Protection of unpainted and finished surfaces.
7. Coverage and hide shall be complete. When color or undercoats show through final coat, recoat until the paint film is of uniform finish, color, appearance, and coverage, at no additional cost to Owner.
8. Edges of paint or finish adjoining other materials or colors shall be sharp and clean without overlapping.

B. Methods

1. Application may be by roller, brush, spray or other approved means.

2. When utilizing spraying, be careful not to use methods which will affect other trades work in adjacent areas.

C. Mixing

1. Mechanically mix before use.
2. Agitate during application as required.
3. Do not tint or shade in field unless permitted by Architect.

D. Thinning

1. Dilute only as required to achieve suitable application viscosity.
2. Use only type and amount recommended by manufacturer.

E. Approvals: Do not apply succeeding coat of paint until previous coat has been inspected and written approval is given.

F. Electrical Conduits

1. Do not paint any electrical conduit or boxes unless they are exposed and abutting a surface that is to be painted or stained.
2. Conduits and boxes to be painted shall be given a coat of galvanizing pretreatment followed by the paint system for the adjoining surface.

G. Protection of Surfaces

1. Provide covers, drop cloths and masking to protect unpainted surfaces previously finish painted. Use special care in protecting electrical and mechanical items which may be damaged by the painting operations (i.e., overspray and solvents that might damage the internals of the item).
2. If possible, remove items not to be painted such as hardware, accessories, electrical plates, lighting fixtures and/or trim, mechanical grilles and louvers and similar items in contact with painted surfaces.
3. Use caution when painting exterior work to avoid wind carrying overspray, drippings, etc., onto adjacent structures, facilities and vehicles.
4. Following completion of painting, reinstall removed items by workmen skilled in the trade involved and remove all covers, masking and drop cloths.

END OF SECTION

SECTION 10 14 10

INTERIOR SIGNAGE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work includes:

1. Room numbers.
2. Room identification.
3. Restrooms
   a. Wheel Chair Accessible
   b. Non-Accessible
4. Directional/Informational signs.
5. Emergency escape directories.
6. Posted occupancy limit.

B. All signs which identify permanent facilities/accommodations shall be tactile and braille and limited minimally to room numbers, restrooms, floor identification and room names as deemed appropriate by the Owner.

1.02 SUBMITTALS

A. Shop Drawings: Submit manufacturer's product data, where applicable, and complete drawings showing all identifying devices and installation details in accordance with the requirements of the General Conditions.

B. Samples: Submit samples for materials, finishes, colors, letter styles, etc., as required for selection and approval by Architect prior to fabrication of identifying devices.

C. Final signage schedule must be approved by Owner prior to fabrication. Submittal to Owner should be made through the Architect.

1.03 QUALITY ASSURANCE

A. Signage Standards: Conform to the Americans with Disabilities Act (ADA) Standards where applicable and to the extent as indicated.

B. Acceptable Manufacturers: All units are to be custom fabricated; manufacturer's products meeting the specifications will be acceptable. Manufacturers must be regularly engaged in fabrication and installation of signage units and related identifying devices.

1. Fabricator shall make at least one visit to the site before production begins to review all sign locations and installation conditions with Architect and Owner's representative.

2. Fabricator must review all dimensional changes with Architect.

C. Approvals: All identifying devices shall be approved at the fabricator's shop by the Architect prior to shipment and installation.

D. Spelling and Braille Accuracy: Responsibility of sign manufacturer.

E. The Owner has the right to renumber the room numbers during construction. Manufacturer must not begin fabrication of room number plates until room numbers have been approved by the Owner, in writing, through the Architect.

F. Room identifications will be provided to the Contractor by the Owner during construction.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original shipping cartons with seals unbroken.

B. Protect materials from physical damage.

C. Store materials in clean, dry area.

D. Inspect all materials prior to installation to assure proper function and condition of all items.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Locations, Quantities, Graphics and Copy: As indicated on drawings and/or specified (scheduled) herein.

2.02 MATERIALS

A. Plates: High pressure phenolic "ES" plastic; scratch resistant, non-static, thermoset, rated self-extinguishing.

1. Colors: As selected by Architect.
2. Thickness: 3/32" for ADA plates; 1/16" for non-raised copy (flat) plates.

B. Changeable Copy: Provide 3/32" thick plastic back-up plate laminated to back of face plate to create slot for removable nameplates.

C. Provide an integral method to create tactile and Braille signs; producing a unitary component. Glued on or laminated letters or Braille cells are not acceptable.

2.03 DESIGN GUIDELINES

A. Plate Shape: Square cornered; do not bevel edges.

B. Letter Style

1. ADA Signs: Helvetica medium, all capital letters.
2. All Other Signs: Helvetica medium, mixed upper and lower case.

C. Tactile Letters and Braille: Grade II braille; raised 1/32" above background surface. Provide Braille dome topped same color as background. Sign manufacturer shall be responsible for verifying accuracy of spelling, both tactile and Braille.

D. Letter Size

1. Tactile Signs: Minimum letter size is 5/8" for capital letters. Room numbers to be 1".
2. Non-tactile Signs: Between 3/8" and 1" capital letter height. Larger letters are permitted on directional signs or on signs where reading distance is greater than 15'-0".
3. Overhead Signs: Minimum 3" copy. Mixed upper and lower case is permissible. Non-tactile is permissible.

2.04 METHOD OF MANUFACTURING

A. Tactile Signs: Relief engraved plates.

B. Non-Tactile Signs: Routed engraved.

2.05 SIGNS REQUIRED FOR TACTILE/BRAILLE

A. Room Numbers: 2-1/4" x 6-3/4" plate with 1" numerals centered horizontally on plate with Braille directly below numerals.

B. Room Identification: This sign is in addition to Room Number specified in 2.05A.

1. Size determined by copy requirements, laid out flush left with 3/4" margin on left, room name in 5/8" caps with Braille directly below type copy, all flush left.

C. Restrooms - Wheel Chair Accessible: Approximately 6” wide x 8” high plate with 1" capital letters (MEN or WOMEN), centered on the plate with Braille centered directly below the word. Provide a routed engraved wheel chair access symbol and a universal man or woman symbol located above the word. No border.

D. Restrooms - Non-Accessible: Two plates required.

1. 6-3/4" wide by 3-3/4" high plate with 1" room number centered horizontally on plate with braille centered directly below numerals. "Men" and "Women" will appear in 3/4 inch capital letters, centered horizontally on the plate with Braille centered directly below the word.
2. 6-3/4" x 6-3/4" plate with 5/8" raised caps informing location of nearest accessible restroom. Same message in Braille centered below copy.

E. Directional/Informational Signs: Wall mounted; non-tactile; in upper and lower case. Letter height shall be at least 1" cap height for directional signs. Letter sizes for informational signs may be less than 1".

2.06 SIGNS REQUIRED FOR NON-TACTILE/BRAILLE SIGNAGE

A. Plate Shape: Square cornered; do not bevel edges.

B. Plate Heights

1. 2-1/4" for one line of copy.
2. 3-3/4" for two lines of copy.
3. 5-1/4" for three lines of copy.

C. Changeable Copy Plates

1. Height: Same as in "B" above.
2. Length: 7-1/2"
3. Face openings of slot: 1" high with 3/4" margin at ends and bottom.
4. Allow 1/2" vertically between slot openings.
5. Slots behind openings: Allow for 1-1/4" wide x 1/16" thick blank changeable copy strips supplied by the Contractor for future engraving by Owner.
6. Tactile room numbers with Braille may appear on the face of the sign frame.

2.07 EMERGENCY ESCAPE DIRECTORY

A. Description: 18" x 12". Extruded aluminum "F" frame with anodized medium bronze finish and non-glare acrylic face. Provide with rigid masonite backing.

B. Copy: Color screen printed removable graphic of floor plan showing escape route from installed location. Locate at building main entrance and primary exits.

2.08 POSTED OCCUPANCY LIMIT

A. Posted Occupancy Limit: Provide sign reading, "Maximum Occupants Permitted This Space". Provide signage in accordance with OBC 1003.2.2.5 “Posting of Occupant Load”. Locate signs in the indoor practice field.

2.09 COPY POSITION

A. Lines of copy laid out flush left with a margin of 3/4" along the left edge of plate. Exceptions are small room numbers and restrooms shall be centered on the plate.

B. Left hand, right hand and bottom margins are 3/4". Vertical spacing measured between lower case letters is 3/4". Overall width and height of a plate is achieved with multiples of 3/4".

C. Locate directional arrows in upper left hand corner of plate. Arrows count as one line of copy.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mount signs plumb and level.

B. Mount all identification devices with 3/4" foam tape on all four edges.

3.02 SIGNAGE SCHEDULE

A. Provide the following Sign Plates

1. Room Identification Signs: For bidding purposes, provide 9 room identification signs. Each sign will contain 20 symbols/characters arranged in two lines.
2. Women, combined with room number and handicap symbol and international symbol, as applicable, at each restroom.
3. Men, combined with room number and handicap symbol and international symbol, as applicable, at each restroom.

B. Provide room numbers at all door locations.

C. Emergency Escape Directory: As specified hereinbefore.

D. Directional/Informational Signs: For bidding purposes, provide one per lobby and in the practice area. Each sign will contain 25 symbols/characters arranged in two lines. Locate as directed by Architect.

E. Posted Occupancy Limit: As specified hereinbefore.

F. Sign Locations

1. Single Doors: Locate signs on the wall next to the latch side of the door, 1" from the outside edge of the door frame and with the top edge of the uppermost sign 61-1/2" A.F.F.
2. Pairs of Doors: Locate signs as specified above for single doors, except Architect will direct in field if sign occurs on right or left jamb of opening.
3. Doors with Borrowed Lights: Locate as directed by Architect.

3.03 CLEAN UP

A. After completion of work remove all debris and tools from the premises, clean all adhesive spatter and run-over from finished surfaces and wash all plated clean of fingermarks and soil. Polish sign surfaces with a soft cotton rag.

END OF SECTION

SECTION 10 22 26

FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide sound insulated, manually operated, folding, flat panel operable walls as indicated, complete including required fasteners, fittings and accessories.

1.02 QUALITY ASSURANCE

A. Installer: Factory trained personnel regularly engaged in installation and maintenance of the specified operable wall.

B. Guaranty: Manufacturer shall provide 2 year guaranty covering workmanship, materials, installation and operation.

1.03 SUBMITTALS

A. Shop Drawings: Submit product data and layout drawings in accordance with the General Conditions and Section 01 33 23.

B. Samples: Submit samples of panel finish for selection by Architect.

C. Operation and Maintenance Manuals: Submit manuals and special tools in accordance with Section 01 78 21.

PART 2 PRODUCTS

2.01 FOLDING PARTITIONS

A. Manufacturer: Drawings and specifications are based on MODERNFOLD Acoustic-Seal 933. Equal products by EMCO; HUFCOR; KWIK-WALL and PANELFOLD are acceptable providing they meet or exceed the requirements specified herein.

B. Operation: Consists of a series of continuously hinged , manually operated, flat steel panels, top supported with operable floor seals.

1. Final closure accomplished by expanding jamb from panel edge or hinged panel as required by each door condition (i.e. partitions with pocket doors require expanding jamb).

C. Panel Construction

1. Size: 3 inches thick in manufacturer's standard widths.
2. Panel Skins: 21 gage steel.
3. Core (Frame): 16 gage steel.
4. Top Channel Assembly: Reinforced to support suspension components.
5. "Wrap-around" skin/panel construction shall, with astragal seals, provide a minimum "groove" appearance at the vertical panel joints.
6. Weight: Approximately 10 pounds per square foot (average hanging).

D. Panel Finish: Factory applied, Class 1 rated material, as per OBC with flame spread 0-25 as determined by ASTM E84.

1. Provide reinforced vinyl with woven backing weighing not less than 30 ounces per linear yard. Color and pattern as selected by Architect.

E. Sound Seals

1. Vertical Seals Between Panels: Tongue and groove configuration astragals incorporating vinyl acoustical seals.
2. Horizontal Top Seals: Continuous contact extruded vinyl.
3. Manual Floor Seals: Designed to provide minimum 1 inch nominal operating clearance; activated by a removable handle. Seals on each panel shall be activated simultaneously.

F. Suspension System: Continuous "C" channel shape steel track, supported by adjustable steel brackets connected to structural supports with threaded rods.

1. Panels supported by ball-bearing, steel wheel trolley assemblies.

G. Laboratory Acoustical Performance - tested in accordance with ASTM E90: STC rating of no less than 49. Provide written test results on request.

2.02 POCKET DOOR

A. Manufacturer: Drawings and specifications are based on MODERNFOLD Stowaway Type II. Equal products by other acceptable manufacturers listed in 2.01A are acceptable providing they meet or exceed the requirements specified herein.

B. Door Construction

1. Size: Nominal 2.75 inches thick in equal widths to close opening.
2. Panel Skins: Class A Flame Spread Rated moisture resistant gypsum board.
3. Core (Frame): Extruded aluminum.
4. Top Channel Assembly: Reinforced to support suspension components.
5. Sound Seals: Gasketed astragal seals in vertical edges and jambs; fixed sweeps on horizontal edges.

6. Weight: Approximately 8 pounds per square foot (average hanging).
7. Hinges: Type and quantity as recommended by manufacturer for door height and weight.
   a. Finish: US26D.
8. Provide manufacturers standard latching type hardware.

C. Door Panel Finish: Wood veneer. White oak finished to match wood doors specified in Section 08 14 00. Field finished, see Section 09 91 00.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that openings have been completely prepared in accordance with manufacturer's requirements. Notify Architect of conditions detrimental to operable wall installation and operation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

END OF SECTION

SECTION 11 52 13

PROJECTION SCREENS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide motor operated, above ceiling mount front projection screen complete with all controls, mounting brackets and hardware.

B. Provide manually operated, wall mount front projection screen complete with all mounting brackets and hardware.

1.02 RELATED SECTIONS

A. Electrical: Division 26.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data in accordance with the requirements of the General Conditions and Section 01 33 23.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery items in manufacturer's original protective packaging.

B. Store items in original packaging to prevent soiling and physical damage.

C. Handle so as to prevent damage to finished surface.

PART 2 PRODUCTS

2.01 PROJECTION SCREENS

A. Motor Operated Projection Screen

1. Type: Motor operated, remote controlled, recessed ceiling mounted.
2. Screen: Flame retardant and mildew resistant, mat white with black masking borders. Vertical seams permitted at minimum 6' on center. HDTV 16:9 format.
   a. Provide extra drop length of dimension indicated to comply with the following requirements for fabric color and location of drop length:
      1) Color: Black.
      2) Location: At top of screen.

3) Provide drop length as required for bottom of screen to be set 3' above floor. Coordinate each screen with ceiling/screen mounting height

3. Sizes: As indicated on schedule contained herein.
4. Doors: Independently motorized. Field finished to match ceiling.
5. Motor: 3-wire quick reversal type; ball bearing with automatic overload cut-off and integral interlocking gears.
   a. Power: 115V, 60 Hz, 3.5 amp.
   b. Controls: Key operated 3-position switch ("UP", "OFF", "DOWN").
   c. Provide with pre-set but accessible limit switches to automatically stop screen fabric in the up and down position. Provide positive stop action.
6. Case: Extruded aluminum back, top and front with stamped steel end caps.
7. Mounting Brackets: Provide ceiling mount type brackets of quantity as required by manufacturer.
8. Manufacturer: Signature Series V Motorized Screen with M1300 Viewing Surface by DRAPER or equal by DA-LITE SCREEN COMPANY, BRETFORD/KNOX MANUFACTURING.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install screens in neat, plumb, true alignment in locations indicated on drawings and as detailed. Comply with written installation instructions of screen manufacturer.

B. Coordinate above ceiling mount with ceiling grid layout.

END OF SECTION

SECTION 11 66 26

WALL PADDING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide labor, materials and accessories necessary to install wall padding as specified herein and indicated on drawings.

1.02 SUBMITTALS

A. Submit manufacturer's product data and installation instructions.

B. Shop Drawings: Submit wall padding layout.

1.03 QUALITY ASSURANCE

A. Conform to current code requirements for flame spread and smoke development.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturer: PORTER; AMERICAN ATHLETIC INC.; PROMATS; INSTITUTIONAL PRODUCTS, INC. (IPI), BPI or equal.

B. Description: Panels consisting of 3/8" CDX plywood back, bonded to 1-1/2" polyurethane foam core and 14 oz. vinyl coated nylon facing.

C. Sizes: As indicated on drawings.

D. Color: As selected by Architect.

E. Attachment Clips: “Z” clips mounted on wall and panel for concealed attachment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions. Securely fix wall panels by means of Z-clips attached to wall. Engage panel mounted Z-clips into wall mounted clips. No visible fasteners permitted.

END OF SECTION

SECTION 12 33 55

PLASTIC LAMINATE FACED CASEWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide plastic laminate casework as indicated on drawings.

B. Work includes fabrication and installation of standard base and wall cabinet components, shelving, fillers, panels and other units as indicated.

C. Accessories common to casework are included as work of this section.

D. Related Work Specified in Other Sections
1. Wood Blocking: Section 06 10 00.
2. Countertops: Section 06 61 17.
3. Vinyl Base: Section 09 65 00.

1.02 QUALITY ASSURANCE

A. Fabricator qualifications: A firm specializing in the fabrication of millwork with a satisfactory record of performance on projects of comparable size and quality. Fabricator shall be acceptable to the Architect.

B. Installation: Performed only by experienced skilled finish carpenters.

C. Catalog Standards
1. Manufacturer's catalog numbers, where shown, are for convenience in identifying cabinet work.
2. Use of a specific manufacturer's catalog numbers is not to preclude the use of any other acceptable manufacturer's product or procedures that may be equivalent.

D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard:
1. ANSI: American National Standards Institute.
2. AWI: Architectural Woodwork Institute.
3. NEMA: National Electrical Manufacturer's Association.
4. ASTM: American Society for Testing and Materials.
5. CS: Commercial Standard.

E. Quality Grade: Materials and fabrication shall be "custom grade" in accordance with "Quality Standard Illustrated," of the AWI conforming to the following sections:
1. Section 200: Plywood and particleboard.
2. Section 400: Casework.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's/fabricator's data and installation instructions for each type of casework unit.

B. Samples: Submit samples of specified finishes.

C. Shop Drawings
1. Submit shop drawings for casework showing plans, elevations, ends and cross sections.
2. Show details and location of anchorages and fitting to floors, walls and base.
3. Include layout of units with relation to surrounding walls, doors, windows and other building components.

1.04 DELIVERY, STORAGE AND HANDLING

A. Protect casework during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver casework until concrete, masonry and other similar wet work has been completed and is thoroughly dry, outside door openings are permanently watertight, exterior windows are glazed and, in case of temperature dropping below 60 degrees F., until temporary heating and ventilating systems are in operation.

C. Store casework in dry, well-ventilated spaces with constant minimum temperature of 60 degrees F., and maximum relative humidity of 55%.

1.05 PROJECT CONDITIONS

A. Provide and maintain a constant temperature and humidity before, during and after installation as required to maintain optimum moisture content of installed materials.

B. Obtain measurements and verify dimensions and details before proceeding with finish carpentry.

1.06 WARRANTY

A. Plastic laminate faced casework to be guaranteed by manufacturer, and Contractor jointly and severally to the Owner for three years, to be free of defects due to faulty materials, workmanship, or performance.

B. Warranty not to include damage sustained as a result of abuse, negligence, use beyond that of it's intended function by the Owner, acts of God, or unnatural events or causes beyond the control of the manufacturer.

C. Include repair and replacement of defective materials and components at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Products of the following manufacturers meeting or exceeding the standards specified herein are acceptable:
   1. STEVENS INDUSTRIES, INC.
   2. LSI CORPORATION
   3. TMI SYSTEMS DESIGN CORPORATION
   4. MFI, MERCHANDISE FIXTURES, INC.

2.02 MATERIALS

A. Particle Board (Substrate for Laminate Surfaces): High density industrial grade with a minimum density of 45 pounds per cubic foot and a moisture content between 9% maximum and 6% minimum, meeting or exceeding ANSI A208.1 Grade M-3 or ASTM D1037.

B. Fiberboard: Uniform, medium density conforming to ANSI A208.2. Maximum moisture content of 8%. Meet the following minimum standards:
   1. Internal Bond: 125 psi.
   2. Modulus of Rupture: 4,000 psi.
   3. Modulus of Elasticity: 400,000 psi.
   4. Screw Holding Power: 325 pounds.
   5. Density: Minimum 50 pounds per cubic foot.

C. Hardboard: Tempered, smooth both sides; conforming to ANSI/AHA A135.4 Class 1.

D. Lumber: Optional framing material for concealed framing. Conform to AWI requirements premium grade; provide in suitable species of manufacturer's option.

E. Plastic Laminate: Conform to the requirements of the National Electrical Manufacturer's Association (NEMA) Publication Number LD-3. Plastic laminate shall be WILSONART, FORMICA, PIONITE, or NEVAMAR. Colors, patterns and finishes shall be as selected by Architect from the manufacturer's full range of standard colors, patterns and finishes. Manufacturer, finish and color to match plastic laminate specified in Section 06400.
   1. General Purpose Horizontal Grade: 0.05 inches thick.
   2. General Purpose Vertical Grade: 0.028 inches thick.
   3. Backing Sheet Grade: 0.02 inches thick.
   4. Post-Forming Grade: 0.042 inches thick.
   5. Cabinet Liner: 0.02 inches thick.
   6. Fill and seal plastic laminate joints with Seamfil by KAMPEL ENTERPRISES, INC. or FormFill by FORMFILL PRODUCTS (UNIKA USA). Colors specifically mixed by manufacturer to match plastic laminate.

F. Pressure Fused Laminate/Interior Surfacing

1. Melamine resin impregnated, 100 gram PSM minimum, surface laminated to core under pressure.
2. Meet NEMA LD3.1-1991 GP28 standards and NEMA LD3-1991 CL20 standards.
3. White pressure fused laminate for cabinet interiors behind door and drawers, interiors of all open cabinets unless otherwise specified, and underside of wall cabinet unless otherwise specified.
4. Shall be balanced at all concealed surfaces with phenolic backer. Unsurfaced coreboard not allowed.

G. Hardware Items: All exposed hardware to be polished stainless steel finish.
1. Drawer Slides: Self-closing, side mounting type with nylon tire, steel ball-bearing rollers. Manufactured by BLUM, GRASS, AMEROCK, KNAPE & VOGT; ACCURIDE. Load capacity as follows:
   a. 75 pounds: Drawers up to 3-1/2 inches deep: Similar to ACCURIDE Series 2132.
   b. 100 pounds: Drawers up to 8 inches deep: Similar to ACCURIDE Series 2832.
   c. 150 pounds: Drawers over 8 inches deep, all file drawers: Similar to ACCURIDE Series 4034.
2. Drawer and Door locks: 5-pin tumbler removable core, dead bolt. BEST; NATIONAL LOCK; CORBIN. Key and masterkey locks as directed by Associate Architect. Provide 2 keys per cylinder and 5 masterkeys per master set.
3. Concealed Hinges: European style, self-closing, type as required for construction. Metallamet by HAFELE; similar by GRASS; PRAMETE; BLUM.
4. Continuous Hinge: 780 HD Roton Hinge by HAGER. Aluminum with finish as selected by Architect.
5. Drawer and Door Pulls: Wire pull, 5/16" diameter x 3-1/3" long x 1-5/16" extension. STANLEY, GRASS; BLUM, HAFELE.
6. Adjustable Cabinet Shelf Supports: Provide metal pilaster type or hardwood drilled type, manufacturer's standard.
   a. Metal Type: KNAPE & VOGT (KV) steel nickel plated.
      1) Standards: KV #255 NP for dado installation.
      2) Clips: KV #256 NP.
   b. Wood Type: Provide hardwood verticals with adjustment holes located 1/2" on center. Provide shelf clips of type that locks shelf in place.
7. Catches: Magnetic, STANLEY #45 or equal by NATIONAL LOCK or EPCO.

H. Glue: Waterproof adhesive (phenol, resorcinol or melamine) base meeting requirements of CS 253 for "Wet Use" unless otherwise specified in specific sections.

I. Plywood: Birch hardwood plywood conforming to AWI Section 200 for veneer core material, AWI "custom" grade, provide with waterproof glue.

2.03 FABRICATION - CASEWORK

A. General: Except as specified hereinafter, fabricate all work in accordance with AWI

quality standards as specified. Work not specified with a level of quality shall be not less than Custom quality per AWI.

1. Provide complete factory-fabricated and finished components which, when assembled on site, will provide an integral system of storage and work surfaces.
2. Provide locks where indicated.
3. Make cut-outs and other provisions for the work of other trades and as indicated or required for installation.
4. Assemble cabinets with accurate router grooves 1/8" deep with glue and nails and screws.
5. Apply plastic laminate to exposed ends after assembly to conceal screws in end cabinet.
6. All particle board panels to be balanced construction.

B. Subbases: Provide continuous plywood closed bases capable of being leveled to meet site conditions; subbase to be unfinished to receive resilient base. See Section 09650.

C. Base Cabinets

1. Sides and Bottoms: Construct of 3/4" thick particle board with interior of cabinet finished with cabinet liner or polyester laminate. Provide balanced constructed panels with neutral colored backer sheet at concealed conditions and finish laminate at exposed conditions.
2. Backs: Standard 1/4" prefinished hardboard. Install in housed joints in surrounding panels. All backs exposed to view to be neutral colored except where indicated to match vertical color surfaces.
   Rear, unexposed side of backs to receive continuous hot melt glue at joint between back and sides/top/bottom for sealing against moisture and vermin, and to further contribute to cabinet stability.
3. Frame: Provide frame construction of 3/4" thick particle board or lumber dadoed into sides at the following:
   a. As sub-top.
   b. At all locked drawers and doors.
4. Runners: Provide runners or frame construction between all drawers.
5. Shelves: Provide fixed and adjustable shelves with particle board core where indicated on drawings. Provide shelves adjustable on 1/2" centers. Except for exposed shelving conditions, finish shelves with neutral colored polyester laminate or liner grade laminate. Finish front and rear edges with PVC "T" edge.
   a. Shelves under 36" wide: 3/4" thick, except all open shelves to be 1" thick.
   b. Shelves 36" to 42" wide: 1" thick.
   c. Shelves over 42" wide: Construct in accordance with AWI Section 400 to support minimum 30 lbs./running foot of shelf with deflection limited to 1/4" or provide intermediate supports to limit the span to ranges specified above.
6. Finish
   a. Casework Edges: Except where cabinet design requires matching laminate edges and/or "T" edge, finish front edges of sides, frames,

and bottom with PVC sheet, black, gray or neutral colored as approved by Architect.

b. Exposed Exterior of Casework: Finish exposed portion of cabinet with vertical grade plastic laminate in solid color finish as selected by Architect.

c. Interior of Casework

1) Semi-Concealed (behind doors): Neutral colored polyester or cabinet liner laminate.

2) Exposed: Vertical grade laminate to match exposed casework.

d. Shelves: Same as specified for interior of casework. "T" edge typical except where cabinet design requires matching laminate self edge.

D. Drawers

1. Body: Construct of fiberboard with polyester laminate finish on faces and PVC on exposed top edges. Subfronts, sides and back fabricated with shouldered lock joint or dado construction and routed to receive bottom.
   a. Sides and Back: 1/2" thick.
   b. Subfront: 5/8" thick.
2. Bottom: 1/4" thick prefinished hardboard, housed and glued, into front, sides and back. Underside of drawer to receive continuous hot melt glue at joint between bottom and back/sides/front for sealing and rigidity. Reinforce drawer bottoms as required with intermediate spreaders.
3. Front: 3/4" thick particle board front finished with vertical grade plastic laminate on exposed face and cabinet liner laminate on interior side; total thickness 13/16" thick. Except where cabinet design requires self edge matching laminate edges (see cabinet design), edges to be finished with PVC "T" edging, black, gray or neutral color as selected by Architect; corners rounded.
   a. Where adjacent door sizes require core thickness in excess of 3/4", provide drawer fronts to match door thickness. Verify conditions with Architect.
4. Install on proper sized slides specified herein.

E. Doors: Construct and finish same as drawer fronts except core construction to vary as follows:

1. Doors over 30" x 48": Construct from 1" to 1-1/4" thick particle board core.
2. Doors over 36" x 60": Construct as 1-3/8" thick hollow core units in accordance with AWI Section 1300.

F. Wall Cabinets: Construct and finish same as base cabinets except provide suitable hang rail of 3/4" plywood secured to cabinet frame.

1. Where wall cabinets close to soffit or ceiling, provide fascia scribed to conditions and leveled on bottom to permit level installation of cabinets. Finish of fascia to match cabinet.

G. Design

1. Configuration of casework is indicated on drawings.
2. The detailing and design required to provide rigid, solid and structurally

adequate casework is the responsibility of the fabricator; within parameters of AWI specifications and as approved by Architect.

3. The following conditions require special attention:
   a. Casework exceeding 42" in width between supports.
   b. Sink and/or equipment cutouts and supports.
   c. Countertops exceeding 24" unsupported.
   d. Wall and Ceiling Mounted Casework: Provide integral framing in casework of size, strength, and in locations which allow unit to be screw attached to proper substrate and remain rigidly in place.

PART 3 EXECUTION

3.01 CASEWORK INSTALLATION

A. General
1. Install plumb, level, true and straight with no distortions so that doors and drawers will fit openings properly and be accurately aligned.
2. Shim as required using concealed shims.
3. Where casework abuts other finished work, scribe and apply filler strips for accurate fit with concealed fasteners.
4. Where possible, assemble units into one integral unit with joints flush, tight and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16".
5. Anchor cabinet units securely in place with concealed (when doors and drawers are closed) fasteners, anchored into structural support members of wall construction. Comply with manufacturer's instructions and recommendations for support of unit.
6. Adjust casework and hardware so that doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

B. Base Cabinets
1. Fasten each individual cabinet to floor at toe space, with fasteners spaced at 24" on center.
2. Bolt continuous cabinets together.
3. Secure individual cabinets with not less than 2 fasteners into floor, where they do not adjoin other cabinets.

C. Wall Cabinets
1. Verify that wood blocking has been installed at required locations.
2. Bolt continuous cabinets together.
3. Secure individual cabinets with not less than 2 fasteners into wall (wood blocking), where they do not adjoin other cabinets.

3.02 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.

1. Patch surfaces damaged by installation to prior condition as approved or replace damaged units as directed.

B. Clean shop-finished surfaces, touch-up as required, and remove or refinish damaged or soiled areas, as acceptable to Architect.
   1. Dust cabinet interiors. Clean exterior surfaces to original condition.

C. Advise Contractor of procedures and precautions for protection of materials and installed casework from damage by work of other trades.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Common work results for requirements specifically applicable to Division 22.

B. Requirements of Division 01 Specifications, General Provisions of the Contract and General and Supplementary Conditions apply to this Division.

1.02 REFERENCES

A. AGA: American Gas Association

B. ANSI: American National Standards Institute

C. ASME: American Society for Mechanical Engineers

D. ASTM: American Society for Testing and Materials

E. AWWA: American Water Works Association

F. MSS: Manufacturer's Standardization Society of the Valve and Fitting Industry

G. NEMA: National Electrical Manufacturers' Association

H. NFPA: National Fire Protection Association

I. UL: Underwriters' Laboratories, Inc.

1.03 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01 including required number of copies.

B. Include Products as specified in the individual sections of Division 22.

C. Group submittals to include complete information of related systems, products, and accessories in a single submittal.

D. Prepare shop drawings completely independent of the Engineer of Record's CADD files. Should the Contractor or Vendor wish to use the Engineer of Record's CADD files as the basis for developing their shop drawings, a release form, obtainable from the Engineer or Architect, must be signed and a nominal charge of $30.00 per sheet must be made payable to the engineering firm to cover the cost of preparing the drawings for use by others.

E. Assist in the preparation of coordinated room layouts as specified in Division 01 and Section 23 05 00. Include coordination of concrete pads and foundations including anchor bolt and sleeve locations.

F. Submit copies of shop drawings in accordance with Division 01, for plumbing equipment and piping systems.

G. Brochures: Submit manufacturer's product data and brochures including:
   1. Complete descriptions
   2. Illustrations
   3. Rating data, accessories, dimensional data, and applicable options and features marked for the specific items scheduled on drawings and specified herein
   4. Capacities stated in the terms specified
   5. Performance and rating data for plumbing equipment.

1.04 REGULATORY REQUIREMENTS

A. Perform Work specified in Division 22 in accordance with standards listed below of the latest applicable edition adopted by the authority having jurisdiction. Where these Specifications are more stringent, they shall take precedence. In case of conflict, obtain a decision from the Architect.
   1. NFPA 54: National Fuel and Gas Code
   2. NFPA 101: Life Safety Code
   3. ANSI Handicapped Code-A117.1
   4. U.L. Fire Resistance Index
   5. ASTM E814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops
   6. IBC: International Building Code, with Mechanical and Plumbing Codes
   7. Special regulations, supplement, and amendments of the State and/or local authorities having jurisdiction.

B. Comply with the applicable edition date of each regulation as adopted by the authorities having jurisdiction.

1.05 PROJECT/SITE CONDITIONS

A. Layouts indicated on drawings are diagrammatical and intended to show relative positions and arrangement of piping and equipment. Coordinate work with other trades and with measurements obtained at the job site, as applicable, prior to installation. Generally, install work in locations shown on Drawings. Provide necessary, rises, drops, and offsets to fit in the available space unless prevented by Project conditions.

B. If prevented by project conditions, prepare drawings showing proposed rearrangement of Work, including changes to Work specified in other sections. Obtain permission of Architect before proceeding.

C. Place anchors, sleeves, and supports prior to pouring concrete or installation of masonry work.

D. Determine sizes and verify locations of existing utilities on or near site.

E. Keep roads and other spaces clear of materials and debris.

F. Visit site and be informed of conditions under which Work must be performed.

G. Locate equipment requiring periodic servicing so that it is readily accessible. Provide means of service access, following appropriate manufacturer's recommended service clearance space or, as applicable, means of access using duct, wall, or ceiling access doors.

H. Install piping to leave sufficient space for AHJ inspection of wall construction. Coordinate pipe routing with other trades including but not limited to Division 21, 23, 26 and 28.

1.06 FEES AND PERMITS

A. Obtain and pay for all necessary permits and inspection fees required to perform Division 22 work.

1.07 COORDINATION DRAWINGS

A. Prior to commencement of installation, assist in preparation of coordination drawings for work under this Division, as specified in Division 01. Fully cooperate with persons coordinating and performing work under other Divisions.

B. Drawings shall not be formally submitted but shall be kept on site for reference. Notify Architect of conflicts that cannot be resolved.

1.08 COMPLETENESS OF WORK

A. The Contract Documents depict plumbing systems which are intended to be complete and functioning systems. All products, materials, and labor necessary to render a fully functional system to fulfill the design intent shown on the documents shall be provided by the Contractor.

B. Catalog numbers referenced throughout the Division 22 Drawings and Specifications are intended to convey a general understanding of the type and quality of the product required. Where written descriptions differ from information conveyed by a catalog number, the written description shall govern. No extra shall be allowed because a catalog number is found to be incomplete or obsolete.

1.09 REFERENCE STANDARDS AND DEFINITIONS

A. Comply with provisions of Division 01.

1.10 PRODUCT SUBSTITUTIONS

A. Comply with provisions of Division 01.

1.11 RECORD DRAWINGS

A. Provide record drawings that illustrate the work of Division 22 as finally constructed. Deliver record drawings to the Architect in a form suitable for production.

B. Record drawings shall reflect all changes made to the Contract Documents, whether generated by addenda, change orders, or field conditions. Maintain a daily record of these changes and keep current set of drawings showing these changes.

C. Deliver record drawings to Architect within 30 days of Substantial Completion.

1.12 OWNING AND OPERATING MANUALS

A. Comply with the requirements of Division 01, but provide a minimum of three sets.

B. Manuals shall include clear and comprehensive instructions with appropriate graphics and project specific marked data to enable owner to operate and maintain all systems specified in this Division.

C. Copies of reviewed submittals on furnished shall be included.

PART 2 PRODUCTS

2.01 EQUIPMENT SUPPORTS

A. Structural steel for supports: ASTM A36.
   1. Use galvanized members installed in areas of high humidity or condensation, and outside.
   2. Furnish other members with shop coat of red primer.
   3. Retouch primer after field welding.

2.02 FLASHINGS AND COUNTERFLASHINGS

A. Furnish materials and coordinate installation for flashing and counterflashing roof penetrations for vents, pipe, drains, and ducts.

B. Materials:
   1. Sheetmetal: 24 gauge minimum ASTM A525, Class G90
   2. Sheet lead: 3 pounds per square foot
   3. Stainless steel: Minimum 20 gauge
   4. Sheet copper: 24 OZ/SF
   5. Vent Stack Fitting: Josam 1830 or Jay R. Smith 1750

2.03 WALL AND CEILING ACCESS PANELS

A. Style and type as required for material in which installed.

B. Size: 24"x24" minimum, as indicated, or as required to allow inspection, service and removal of items served.

C. 14 gauge minimum sheet metal for doors, 16 gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction.

D. Panels shall have spring hinges with screwdriver locks in non-public areas. Key lock, keyed alike, for panels in public areas.

E. Prime painted or rust inhibitive paint finish.

F. UL labeled when in fire-rated construction, 1-1/2 hour rating.

G. Provide in walls, floors, and ceilings to permit access to all equipment and piping requiring service or adjustment. Examples of such equipment needing access are valves, and equipment needing periodic or replacement maintenance.

H. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.

I. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers.
   1. For masonry and drywall construction: Milcor Style M
   2. For plastered masonry walls and ceiling: Milcor Style K
   3. For ceramic tile or glazed structural tile: Use stainless steel panels

2.04 PIPE ENCLOSURES

A. Minimize number of covers by enclosing maximum number of pipes in each drop.

B. Anchor to equipment or partition.

C. Fasten seams and joints with stainless steel pop rivets.

D. Provide 1-1/2" ceiling flange as closure.

2.05 SLEEVES

A. Materials
   1. Concrete floors, concrete and masonry walls: 18 gauge galvanized sheetmetal.
   2. Drywall partitions: 18 gauge galvanized steel sheet metal.

B. Sleeves shall be sized such that the annular space between outside surface of pipe or pipe insulation and the inside surface of the sleeve is not less than 1/2". Provide larger annular space if required by firestopping product installation instructions.

C. Sleeves supporting riser piping 4" and larger shall have three 6" long reinforcing rods welded radically at 120 degree spacing to the sleeve and shall be installed with the rods embedded in the concrete slab.

PART 3 EXECUTION

3.01 EXCAVATING AND BACKFILLING

A. Contractor shall review Division 33 and shall perform excavation and backfilling in accordance with the most stringent requirements. Contractor shall request clarification before proceeding if there are conflicting instructions.

B. Contract Documents show the approximate location of underground utilities known to exist in the area of construction. Contractor shall determine the exact location of utilities
   1. Locate and uncover existing utilities which require new connections before trenching in the vicinity of indicated utility connection.
   2. Clear all vegetation and other objectionable material from the area required for the excavation and backfill operations. Disposal of material removed by the clearing operation shall be approved by the Owner's Representative.

C. Provide trenching, excavating, and backfilling necessary for performance of work indicated in Contract Documents.

D. Excavate to depths indicated on the drawings or as necessary to permit the installation of pipe, bedding, backfill, structures or appurtenances. Provide a firm, undisturbed, uniform surface in the bottom of trenches. Where excavation exceeds the required depth, bring the excavation to proper grade through the use of an approved incompressible backfill material. Store excavated material and dispose of surplus excavated material.
   1. Excavate trench to sufficient depth to permit a minimum of 36" of cover over the top of the pipe unless otherwise required by pipe elevations indicated on the Drawings. The trench width shall be 18" plus the diameter of the pipe and/or the largest bell.

E. Trenching and excavation shall be unclassified. No extra will be paid in the event that rock is encountered.
   1. Should rock excavation be required, use only experienced personnel for blasting.
   2. Exercise extreme care when blasting with signals of danger given before firing any charge.
   3. Conform to and obey all public authority regulations for the protection of life and property.

F. Provide sheathing, shoring, dewatering, and cleaning necessary to keep trenches and their grades in proper condition and to meet applicable codes.

G. Provide a minimum of 6" of No. 67 crushed stone or clean sand bedding, or equal, in the bottom of the trench to maintain the required grade and continuous support of the bottom quadrant of the pipe. On bell and spigot piping, dig bell holes so bottom of bells do not support pipe.

H. Upon completion of excavation, and prior to the laying of the pipe, the trench bottom shall be brought up to the required elevation with min. 6" pipe bedding. Pipe bedding shall be select material deposited in the trench, and shall be compacted, leveled off, and shaped to obtain a smooth compacted bed along the laying length of the pipe. Material for pipe bedding shall comply with local codes. In absence of local code requirements the bedding shall be bank sand or select back fill material approved by the Architect. Any material used shall pass a 1/4 inch screen.

I. Clean and inspect pipe for defects before lowering into trench for assembly. Install pipe in accordance with provisions of Contract Documents and with the recommendations of the pipe manufacturer.
   1. Ensure pipe is of proper strength and classification for specified service. Discard damaged or defective pipe discovered during pipe laying operations.

2. Maintain alignment and grade during layout operation. Use acceptable method for maintaining grade and alignment to produce desired results.

J. Where crushed stone backfill is required, use No. 67 stone, clean sand or equal.
   1. After bedding has been shaped and the pipe assembled, place crushed stone carefully around the pipe and to a point 12" above the pipe. Backfill above this point shall be as described below:
      a. Backfill areas of vehicular traffic shall consist entirely of crushed stone and compacted crusher run material.
      b. Backfill for shoulders of roadways, sidewalk, and slab on grade structures shall consist entirely of crushed stone.
      c. Backfill areas not subject to vehicular traffic may consist of suitable excavated material as described above.
   2. Where crushed stone is not required, suitable excavated material may be utilized. This includes fine, dry earth or a mixture of earth and shot rock. Rocks larger than 6" in any dimension may not be included in any portion of the backfill material.
   3. Trenches shall be backfilled only after piping has been inspected, tested, and approved by the Architect . All backfill material shall be placed in the trench either by hand or by approved mechanical methods. The compaction of backfill material shall be accompanied by tamping, with hand tools or approved pneumatic tampers, by using vibratory compactors, by puddling, or by any combination of the three. The method of compaction shall be approved and all compaction shall be done to the satisfaction of the Architect. Backfill completely around pipe, including 18" above the pipe, with suitable bank sand, tamped in 4" layers under, around, and over pipe. Water down backfill as required. The remainder of the backfill shall be select backfill material tamped at intervals of no more than 12" depths. All materials to be used as selected material backfill shall be approved by the Architect. If, in the opinion of the Architect, the excavated material does not meet the requirements of selected material, the Contractor shall be required to screen the material prior to its use as selected material backfill. Material used in the upper portion of the backfill or subgrade shall not contain stone, rock, or other material larger than six inches in its longest dimension. No wood, vegetable matter, or other material which, in the opinion of the Architect, is unsuitable shall be included in the backfill. The upper 24" of backfill may be water jetted, if desired. Backfill shall be brought up to finish grade identified on the Architectural Drawings, including additional backfill required to offset settlement during consolidation.

3.02 CUTTING AND PATCHING

A. Repair or replace damage caused by cutting or installation of work specified in Division 22.

B. Perform repairs with materials which match existing and install in accordance with the appropriate section of these specifications.

3.03 FLASHING AND COUNTERFLASHING

A. Counterflash pipes where penetration of roofs and outside walls occur.

3.04 CONNECTION TO EQUIPMENT FURNISHED BY OWNER

A. Connect or install equipment shown on plumbing drawings that requires plumbing connections.

B. Provide piping, shutoff valves, unions, and other piping appurtenances required for a complete installation. Provide backflow preventers and/or pressure reducing valves where required by the equipment design or local code. All components shall be line size unless noted otherwise.

3.05 DELIVERY, STORAGE, AND PROTECTION

A. Insofar as possible, deliver items in manufacturer's original unopened packaging. Where delivery in original packaging is not practical, provide cover and shielding for all items with protective materials to keep them from being damaged. Use care in loading, transporting, unloading, and storing to keep items from being damaged.

B. Store items in a clean, dry place, and protect from damage. Plumbing equipment may not be staged or stored outdoors unless intended for outdoor use.

C. Protect nameplates on motors, pumps, and similar equipment. Do not paint or insulate over nameplate data.

D. Protect plumbing fixtures and brass or chromium plated trim, valves and piping from damage. Cover fixtures during work of finishing trades.

E. Keep dirt and debris out of pipes and ducts.

F. Repair, restore, and replace damaged items.

G. Cover factory finished equipment during work of finished trades.

3.06 SLEEVES

A. Floors: Sleeve all pipe penetrations. Extend sleeve 1-1/2" above finished floor, except piping within pipe chases. Sleeve shall be flush with underside of floor.

B. Masonry or concrete walls: Sleeve all pipe penetrations. Sleeves shall be flush on both sides of wall.

C. Drywall partitions: Sleeve all penetrations of piping in systems over 160 degree F.

D. Seal voids between outside surface of sleeve and wall, partition or floor. Seals shall be airtight.

E. Install piping, insulation and sleeves in strict accordance with applicable U.L. floor or partition assembly instructions. Coordinate with Division //CSI //MF95 7//MF04 07//END_CSI firestop manufacturer's installation instructions.

F. Penetrations not sleeved or firestopped:
   1. Seal voids between pipe and partition. Seals shall be airtight.

3.07 CLEANING PLUMBING SYSTEMS

A. General Cleanup:
   1. Upon completion of contract and progressively as work proceeds, clean up dirt, debris, oil materials, etc., and remove from site, keeping premises in neat and clean condition to satisfaction of the Architect. See Division 01 of specifications for further requirements.
   2. See page, discoloration or other damage to parts of the building, its finish, or furnishings due to Contractor's failure to properly clean piping systems or duct systems shall be repaired without cost to the Owner.

B. Factory Finishes:
   1. Clean items with factory finishes. Touch up bare places, scratches and other minor damage to finishes. Use only factory supplied paint of matching color and formula. If finishes are badly damaged or if there are many damaged, scratched or bare places, refinish the entire item.

C. Domestic Water System:
   1. Flush system progressively by opening building operable valves, faucets and hose bibs and permitting flow to continue from each unit until water runs clear.
   2. Sterilize system in accordance with requirements of State Department of Public Health by the following method or other methods acceptable to authority having jurisdiction.
   3. Introduce chlorine or a solution of calcium or sodium hypochlorite. Fill lines slowly and apply sterilizing agent at a rate of 50 ppm of chlorine as determined by residual chlorine tests at ends of lines. Open and close all valves while system is being chlorinated.
   4. After sterilizing agent has been applied and left standing for 24 hours, test for residual chlorine at ends of lines. If test indicates there is less than 25 ppm, repeat sterilizing process.
   5. After system has been standing 24 hours and test indicates at least 25 ppm of residual chlorine, flush out system until all traces of chemical used are removed.
   6. Have local health department check and approve system before connecting it to existing water system.

3.08 SYSTEMS TESTING

A. Test all systems and equipment installed to demonstrate proper operation.

B. Advise Architect of scheduled systems testing and completed system demonstration/operation schedules so that he may witness, if desired.

C. Correct and retest work found defective when tested.

D. Make repairs to piping systems with new materials. Peening, doping, or caulking of joints or holes will not be acceptable.

E. Domestic Water Piping: Test hot and cold water piping systems upon completion of rough-in, before fixtures are connected, at a hydrostatic pressure of 125 psig or 150% of working pressure whichever is greater for a period of two hours.

F. Drainage and vent system
   1. Test plug opening to permit system to be filled with water, and subject system to 10 foot head of water pressure. System shall hold water for 30 minutes with a drop in water level not to exceed 4 inches in a 4 inch diameter standpipe, and without visible leakage.
   2. If system is tested in sections, a minimum head of 10 feet shall apply.

END OF SECTION

SECTION 22 05 23

VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED WORK

A. Section 22 11 16: Domestic Water Piping

1.02 QUALITY ASSURANCE

A. Valve bodies, shells, and seats: Factory tested.

B. Bronze body valves:
   1. Materials for pressure containing parts: ASTM B-62 (less than 200 psi), B-61 (200 psi and above)
   2. Design, workmanship, testing: MSS-SP-80

C. Iron body valves:
   1. Materials for pressure containing parts: ASTM A126, Grade B
   2. Face-to-face and end-to-end dimensions: ANSI B16.10
   3. Design, workmanship, testing: MSS-SP-70, 71

D. Butterfly valves:
   1. Face-to-face and end-to-end dimensions: MSS-SP-67

E. Valve stems: ASTM B584-78, Class 13C (cast silicon brass), ASTM B-371-79, Alloy A (rolled silicon brass), or other material equally resistant to dezincification.

F. Pressure castings: Free of impregnating materials.

G. Valve name or trademark and working pressure stamped or cast into body.

H. Standard for 200 PSI and 300 PSI valves with metallic seats: ASTM B61-76.

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Iron body valves: Nibco, Stockham, Crane, Milwaukee, Dezurik, Mueller, or Kennedy

B. Bronze body valves: Nibco, Stockham, Milwaukee, Dezurik, or Kennedy

C. Butterfly valves: Nibco, Stockham, Crane, Mueller, or Dezurik

D. Ball valves: Nibco, Apollo, Watts, Milwaukee, Jamesbury or Hammond

2.02 MATERIALS

A. Nibco Figure numbers are indicated below unless noted otherwise:

B. Check Valves:
   1. Domestic Water:
      a. 2" and less, Figure T-433, or S-433, threaded or solder, Class 150
      b. 2-1/2" and up: Bronze body, cap, and disc, flanged, Class 150

C. Ball Valves
   1. Domestic Water
      a. 2" and less, Figure T585-70 or S-585-70, 2-piece, full port, 600 psi, WOG, TFE seats
      b. 2-1/2" and up, Watts G4000-FDA-200 psi, Class 125 meeting MSS-SP-72-92 or equal

D. Butterfly Valves - 2-1/2" And Up:
   1. Domestic Water: Figure LD-2000, lug type, 200 psi, Class 125, EPDM liner, and aluminum bronze disc, meeting AWWA C504-88.
   2. Butterfly valves rated bubble tight for dead end service at full pressure in both directions without the need for downstream blind flange.
   3. Provide hand wheel and closed housing worm gear on valves 8 inches and larger. Provide clamp lock hand lever operators on valves less than 8 inches.

E. Valve connections: Two inches and smaller - threaded; 2-1/2 inches and larger - flanged.

F. Provide chain operators for gate valves, butterfly valves, and plug cocks located in mechanical rooms as required by mechanical plans or where valves are mounted above 7'-0" A.F.F.

PART 3 EXECUTION

3.01 INSTALLATION

A. Furnish and install valves in each piping connection at each piece of plumbing equipment to allow equipment to be isolated from piping systems.

B. Furnish and install valves above each group of plumbing fixtures.

C. Install valves in water piping systems so ordinary maintenance work can be performed on the equipment that the valves isolate, without having to drain the system beyond the valve.

D. Locate valves so as to be easily accessible by maintenance personnel.

END OF SECTION

SECTION 22 05 29

HANGERS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED WORK

A. Section 22 11 16: Domestic Water Piping

B. Section 22 13 16: Sanitary Waste and Vent Piping

C. Section 22 07 00: Plumbing Insulation

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Anvil, Carpenter and Patterson, Fee and Mason, B-Line, Viking, Reliable, and Michigan. Anvil numbers are used for reference.

2.02 HANGERS

A. Anvil Figure #260 MSS Type 1, clevis hangers for:
   1. Non-insulated steel and galvanized piping 2" through 24" diameter
   2. Non-insulated cast iron pipe
   3. Non-insulated PVC piping

B. Anvil Figure #260 clevis hangers with Figure 167, MSS Type 40 galvanized insulation protection shields (sized for supporting insulation having a compressive strength of 4 psi). Support piping on outside of insulation. Size hangers so that pipe insulation passes through them without interruption.
   1. Domestic hot water piping above 160 degrees F. 4" diameter and less
   2. All other insulated piping

C. Anvil Figure CT-69, MSS Type 10 with adjustable wrought tubing ring hanger, copper plated for:
   1. Non-insulated copper tubing with no longitudinal movement

D. Anvil Figure #CT-121, MSS Type 8, riser clamps (at floor penetrations) to support:
   1. Copper pipe risers

E. Anvil Figure #261, MSS Type 8, riser clamps (at floor slab penetrations) to support:
   1. Steel pipe risers
   2. PVC pipe risers

F. Anvil Powerstrut Trapeze Hangers: Where three or more lines of pipe run parallel, support them with trapeze hangers.

2.03 INSERTS

A. Concrete Insert: Anvil Figure #281, MSS Type 18, universal concrete inserts, adequately sized and correctly positioned to support full load operating systems.

B. Concrete Insert, Wedge Type: Anvil Figure #281, 1/4" to 7/8"

C. Lightweight Concrete Insert: Anvil Figure #285

D. Continuous Concrete Insert: Anvil Powerstrut Figure #PS-349 pre-galvanized

2.04 EXPANSION ANCHORS

A. Hilti Kwik-bolt, zinc plated, metal expansion anchor.

B. Anchor to meet U.L., ICBO-4627 and FM listings.

2.05 CLAMPS

A. C-Clamps: Anvil Figure #92, MSS Type 23.
   1. Use these for attaching hangers to steel beams. Do not weld hanger rods to structural steel members.

B. Malleable Beam Clamps: Anvil Figure #218, MSS Type 30: Use these for attaching hangers to bar joists.

PART 3 EXECUTION

3.01 PIPE HANGERS

A. Support pipes on specified hangers so that equipment, pumps, and fittings do not bear weight or stresses from vibration and swaying of pipe. Support pipe risers at regular intervals in pipe shafts at least once at each floor level or a maximum of 12'-0" apart. Do not use perforated metal, strap iron, or band iron. Do not make offsets in hangers.

B. Maximum allowable spacing of pipe hangers is listed below. Space hangers and brackets at closer intervals where necessary to maintain levels, slopes, and drainage, or to prevent sagging or swaying of pipe.

C. COPPER PIPE - Water
   1. 1/4" to 1-1/4" - 5'0" O.C.
   2. 2" to 2-1/2" - 8'0" O.C.
   3. 3" and above - 10'0" O.C.

D. CAST IRON PIPE
   1. Space hangers not to exceed 10 feet on centers. Provide minimum of two hangers per section close to joint on barrel and at change of direction and branch connection.

E. PVC PIPE
   1. 3/4" to 3" - 4' O.C.
   2. 4" and above - 8' O.C.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION OF PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification of plumbing piping and equipment as specified herein.

1.02 RELATED WORK

A. Division 01: Cutting and Patching.

B. Division 01: Seismic Requirements.

C. Division 01: Shop Drawings, Product Data, and Samples.

D. Division 01: Storage and Protection.

PART 2 PRODUCTS

2.01 NAMEPLATES AND TAGS

A. Acceptable manufacturers: Seton Nameplate Corporation, Marking Services Inc. or equal.

B. Rigid plastic, "Setonite" or Bakelite with engraved lettering, minimum 1/2" high.

C. Brass tags, at least 1-1/2" inches in diameter, with alpha-numeric I.D., permanently stamped black filled letters showing the service, and black filled numbers showing the valve or equipment number. At substantial completion, a schedule of all valves shall be submitted to the Architect and Owner's Representative.

2.02 PIPE MARKERS

A. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering.

B. Plastic Tape Markers: flexible vinyl film tape with pressure sensitive adhesive and printed marking.

2.03 PIPE IDENTIFICATION AND PAINTING

A. Identify all piping as specified herein painted under Division 09.

B. Pipe Identification:
   1. Identify piping by stenciling or tagging (to denote contents and direction of flow) on piping at no more than 25 foot intervals at valves, and at least once in each

separate space through which the pipe passes. Colors shall conform to ASME 13.1.

2. Stenciling shall be a minimum of 2" high letters.

C. Buried piping does not require identification marking, unless noted otherwise in specifications.

D. All piping in central plant and mechanical rooms shall be labeled to identify contents and direction of flow.

2.04 EQUIPMENT AND APPARATUS IDENTIFICATION

A. Acceptable Manufacturers: Seton Name Plate Corporation or equal.

B. Nameplates: Rigid plastic, "Setonite" or Bakelite, with engraved lettering (indicating names and numbers of mechanical apparatus), a minimum of 1/2" high. Fill engraved lettering with a permanent coloring material which contrasts with color of tag material to allow for easy reading.

C. Use names, numbers and abbreviations appearing in schedules on Contract Drawings.

D. Where stenciling is used to identify large pieces of equipment, stenciling shall be in a conspicuous place visible from control panel area and of at least one (1) inch letters and/or numbers. Large pieces of equipment may be stenciled with an oil based enamel or semi-gloss latex.

E. Provide nameplates, located in a conspicuous location directly on the equipment or apparatus, for mechanical equipment including, but not limited to:

1. Plumbing equipment

F. Name tag Fasteners: Commercial quality, rust resisting nuts and bolts with backwashers, self-tapping screws, or rivets. If equipment surface does not allow for direct attachment, use copper or brass rings to attach tags.

G. Valve Tags

1. Each valve shall be identified with a brass tag. The tag shall contain an alpha-numeric I.D. which shall include floor level and building section as part of the I.D.
2. A valve schedule shall be provided to Architect and Owner's Representative. Mount valve schedule under glass and mount as directed by Owner's Representative.
3. Securely fasten tags to valves with a brass "S" hook or chain.

END OF SECTION

SECTION 22 07 00

PLUMBING INSULATION

PART 1 GENERAL

1.01 DEFINITIONS

A. Exposed - Equipment and piping in areas which will be visible without removing ceilings or opening access panels.

B. Concealed - Installed above ceiling, in walls or chases.

C. Outdoors - Exposed to the weather or ambient conditions.

D. Underground - Buried.

1.02 CERTIFICATION/QUALITY ASSURANCE

A. Insulation, adhesives, coatings, sealers, tapes, shall have a flame spread rating of 25 or less and smoke development of 50 or less in accordance with ASTM E-84 and UL 723

B. Materials shall meet the requirements of NFPA 90-A.

1.03 SUBMITTALS

A. Submit manufacturer's product data and installation procedures for review.

PART 2 PRODUCTS

2.01 PIPE AND EQUIPMENT INSULATION

A. Materials for Pipe and Equipment: Provide factory pre-molded insulation for pipe, pipe fittings, and valves.

B. Fitting insulation: Same thickness and material as adjoining pipe insulation.

C. Fiberglass Pipe Insulation:
   1. Acceptable manufacturers: Johns-Manville "Micro-Lok 850"; CertainTeed; Knauf; Owens Corning. Foster Jacket: ASJ fiberglass reinforced kraft paper with aluminum foil; minimum R value of 3.7.
   2. Use on the following services:
      a. Domestic hot water supply piping - 1" thick
      b. Domestic cold water piping - 1/2" thick
      c. Drain bodies, traps and horizontal drain lines receiving cold condensate - 1/2" thick

2.02 MATERIALS FOR FITTINGS, VALVES, AND SPECIAL COVERINGS

A. For all services, use pre-molded insulation for pipe fittings, elbows, tees, butterfly valves, and couplings 2-1/2 and larger. Finish shall be as specified under Products above or as specified below. PVC fitting covers with fiberglass inserts may be used on piping fittings elbows and valves 2" and less for the following services:
   1. Domestic Cold Water
   2. Domestic Hot Water

B. For piping installed above grade exposed-to-the-weather outside the building, cover straight pipe insulation with 0.016" thick aluminum jacket equivalent to Childers and cover fittings with factory formed covers equivalent to Elljacs.

C. For flexible tubular elastomeric pipe and fitting insulation when exposed-to-view inside building or exposed to the weather, finish with two coats of fire retardant self-extinguishing vinyl lacquer type highly flexible coating equivalent to Armacell "Armaflex Finish", custom color blended to match surrounding surfaces.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Deliver and store insulation materials in manufacturer’s containers and kept free from dirt, water, chemical and mechanical damage.

B. Complete piping pressure testing prior to applying insulation.

C. Apply insulation in workmanlike manner by experienced and qualified workmen.

D. Surfaces shall be clean and dry when covering is applied. Covering to be dry when installed and before and during application of any finish, unless such finish requires specifically a wetted surface for application.

E. Adhesives, cements and mastics shall be compatible with materials applied and shall not attack materials in either wet or dry state.

F. Stop duct coverings, including jacket and insulation, at fire penetrations of fire or smoke rated partitions, floors above grade and roofs. "Fan-out" or extend jacketed insulation at least 2" beyond angle frames of fire dampers and secure to wall. Maintain vapor barrier.

3.02 FLEXIBLE SHEET ELASTOMERIC INSULATION

A. Prior to application of flexible sheet elastomeric insulation, thoroughly clean all metal surfaces, making sure that all dirt, scale, loose paint, plaster, and oil has been removed and that surfaces are dry. If surface has been primed, test a two square foot section using adhesive equivalent to Armstrong No. 520 in order to determine whether solvent in adhesive will loosen or lift the primer. If primer is loosened, then remove it. When testing proves acceptable, adhere insulation with smooth side out, using thin but adequate coating of same adhesive. Follow manufacturer's instructions. Coat all butt edges of each

sheet. Stagger all joints. Insulate all standing seams or flanges with same thickness of insulation material as that used on main surface.

3.03 INSTALLATION OF PIPE AND EQUIPMENT COVERING

A. Where glass fiber or flexible tubular elastomeric insulation is used on piping sized 2" and larger, insert a section of foamglass or calcium silicate insulation, at hanger or support points, between pipe and metal shield for full length of shield, to prevent crushing of insulation. Where insulation passes through pipe hangers and across trapeze supports, 12" long metal saddles shall be used. Insulation thickness to be same as adjoining glass fiber insulation. On cold pipe, vapor barrier should be carried through the hanger and sealed. Saddles shall be used where rigid foamglass inserts are not acceptable.

B. Apply foamglass insulation as follows:
   1. Both the circumferential and longitudinal joints shall be buttered with fire-resistive pliable sealer. Voids and cracks shall be filled with sealer. Mastic shall be Foster 30-80 or equal. Secure insulation with 3/4" wide x 0.010" thick aluminum bands on 8" centers.
   2. The circumferential joints shall be staggered.
   3. Fittings, valves, flanges, traps, and air vents shall be insulated with the same thickness of insulation using factory fabricated fitting sections or pre-molded insulated fittings.
   4. Block type insulation shall be adhered by stick-clips or bands, in addition to the sealer, as required to provide support for the insulation.
   5. Finish above furred ceilings and in chases shall be the bare insulation.
   6. Finish in equipment rooms and elsewhere where exposed-to-view shall be //OPT_AR //CHO_S white ASJ jacket.//CHO_N .016" aluminum jacket.//CHO_N white 8 oz canvas paintable jacket.//END_OPT
   7. Finish where exposed-to-the-weather shall be .016 inch thick, Childers, or equal, aluminum jacket on lines and Elljacs, or equal, pre-formed aluminum covering on fittings.
   8. Finish on underground insulation shall be Pittsburgh Corning Pittwrap as recommended by manufacturer.

END OF SECTION

SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Piping and pipe fittings for domestic cold and hot water piping

1.02 RELATED WORK

A. Section 22 05 00: Common Work Results for Plumbing

1.03 SUBMITTALS

A. Submit product data for review on piping and fittings. Submittal data shall include:
   1. Manufacturer of pipe.
   2. Tests or listings by recognized testing laboratory that certifies material composition is in accordance with ANSI/ASTM requirements.
   3. Product data for pipe and fittings to be used on each piping system.
   4. Solder and brazing product data and installation procedures for copper pipe.

PART 2 PRODUCTS

2.01 COPPER PIPE

A. Conform to ASTM B-88 specification for wrought seamless copper.

B. Type L, hard for:
   1. Domestic cold water piping
   2. Domestic hot water

C. Use Type K, rolled, soft for: Piping installed under floor slabs.

2.02 COPPER PIPE FITTINGS

A. Sweat type, wrought copper, ASTM B62, with dimensions conforming to ANSI B16.22 and sweep patterns for copper tubing.

B. Mechanical Couplings: Roll groove rigid type by Victaulic, Gruvlok or Anvil.

C. Mechanically formed tee fittings: "T-Drill" system in compliance with Copper Development Association (CDA), Copper Tube Handbook, and ASME Code for pressure piping ANSI B31.5C. All joints shall be brazed in accordance with CDA Copper Tube Handbook using BCuP filler material. Soft solder joints will not be approved.

D. Mechanical joints: Domestic cold and hot water piping 4" and larger may be joined with rolled grooved copper fittings and valves by Victaulic or Anvil, copper pipe grooved

systems. Gaskets shall be rated for not less than 220 degrees. Joints, materials, and gaskets for grooved systems shall be approved for use in potable water systems.

E. Dielectric Connections:
   1. Provide at junction of copper pipe and equipment with steel piping systems.
   2. Central, Dielectric insulating unions, and insulating flange unions, as manufactured by Central Plastic Company, or CTS Fabrication USA (1-1/2" thru 8").
   3. Provide copper solder joint to plated female iron pipe for sizes 1/2" through 2".
   4. Provide insulating flange unions, malleable female iron pipe thread to copper solder joint flange unions for sizes 2-1/2" through 4".
   5. Brass fittings and valves may not be used for dielectric union locations.

F. Unions: Brass ground joint, 250 lb. working pressure.

G. Nipples: Brass.

H. Grooved copper system:
   1. Victaulic Style 606 or Style 641 rolled grooved copper fittings for domestic cold water and domestic hot water for sizes 3" and larger

2.03 DUCTILE IRON WATER PIPE AND FITTINGS UNDERGROUND

A. Manufactured in accordance with latest revision of ANSI A21.51/AWWA C151.

B. Use Class 52 thickness or heavier for 12" diameter and less and Class 51 thickness or heavier for 14" diameter and larger.

C. Furnish pipe with standard thickness cement lining on inside with a bituminous seal coat and a bituminous coating on the outside.

D. Clearly mark pipe exterior to indicate the manufacturer, date of manufacturer, pipe class and weight.

E. Provide for the following services:
   1. Underground domestic water main services, up to first joint inside interior space

F. Fittings:
   1. Acceptable Manufacturers: Fastite by Acipco, Tyton by U.S. Pipe Co., or Bell-Tite by James B. Clow and Sons
   2. Ductile iron, cement lined, bituminous coated, manufactured in accordance with the latest revision of ANSI/AWWA C110
   3. Furnish with mechanical joints conforming to ANSI A21.11 with 250 psi pressure rating

2.04 PVC AND CPVC PIPE AND FITTINGS

A. Polyvinyl chloride sewer pipe and fittings (4" to 12" diameters) shall be as manufactured by Charlotte or equal. Fittings (14" to 24" diameter) shall be manufactured by Freedom Plastics, Inc.

B. PVC and CPVC pipe, fittings, cement, and joint cleaner for entire project shall be supplied by a single manufacturer.

C. PVC schedule 40, type 1, DWV, ASTM D-2665, 1120, 160 PSI at 73 degrees F. Solvent cement shall meet ASTM No. D-2564 for (PVC-DWV) plastic and pipe fittings. If permitted by governing code authority, may be used for:
   1. Inside gravity { [under floor slab], under and above floor slab in non-sound sensitive areas} sanitary and storm waste drainage systems, with waste temperatures below 140 degrees F.
   2. Do not install PVC piping in return air plenums or spaces used as return air plenums and as approved by the Local Authority Having Jurisdiction

D. CPVC schedule 80, ASTM D-2846, 230 psi at 73 degrees F. Solvent cement shall meet ASTM No. F-493 for chlorinated polyvinyl chloride (CPVC) plastic pipe and fittings. If permitted by governing code authority, may be used for:
   1. Inside gravity, under floor slab sanitary waste drainage systems, where temperature of waste discharged into drainage system exceeds 140 degrees F.

E. PVC schedule 40, Type-PSM, Sewer Pipe, ASTM D-3034 with SDR as gasketed slip type joints. Provide coupling with a rubber ring seal for use in each manhole entry to ensure a surface for adherence of concrete to manhole wall. If permitted by governing code authority, may be used for:
   1. Outside gravity, underground sanitary sewer drainage piping, from 5'-0" outside the building to the connections point to local municipality

F. Fittings:
   1. Permanently identify each fitting in accordance with MSS-SP-2241, and with manufacturer's trademark
   2. Include certification with submittal data that fittings and flanges meet applicable requirements

PART 3 EXECUTION

3.01 INSTALLATION

A. Clean inside of pipe before installation. Keep installed piping clean, and protect ends from foreign matter by capping or plugging them.

B. Install pipe so that it does not interfere with opening of doors or apparatus, access to equipment, or to electrical equipment.

C. Run pipes in straight lines and square with building. Install risers plumb. Make offsets only where indicated and where necessary.

D. Install branch connections using separate tee or lateral fittings for each branch. Do not combine branches into "bullhead tee" arrangement.

E. Do not install water pipes in electric rooms, tele/data rooms, transformer rooms, audio/visual rooms or elevator equipment rooms.

F. Do not install piping above electrical equipment such as starters, variable frequency drives, motor control centers, or disconnects. Maintain code required clearance above, below and to sides of electrical equipment.

G. Provide flanges or unions throughout the pipe systems at all equipment. Make provisions for servicing and removal of equipment without dismantling piping.

H. Piping Expansion:
   1. Install piping to allow thermal expansion and contraction without injury to piping, equipment or structure.
      a. Use loops or expansion joints where necessary and where detailed
      b. Provide pipe guides

I. Branch Lines:
   1. Where possible branch lines shall come off top of mains to prevent sediment, welding slag, or pipe deburrs from entering the branch lines and causing valve leakage or failure.

3.02 PIPE JOINTING

A. Preparing Pipe Ends:
   1. Machine cut pipe ends square
   2. Ream pipe ends, after cutting, to full diameter

B. Soldered and Brazed Joints:
   1. Make Type L copper pipe joints with suitable flux and 95/5, lead free solder.
   2. Make Type K copper pipe joints with silver (BAg series) brazing filler material with flux or copper-phos (BCup series) brazing filler material without flux per the recommendations of the Copper Development Association.
   3. Domestic cold and hot water piping 4" and larger shall be brazed. Copper to copper joints shall be brazed using a copper-phosphorus or copper-phosphorus-silver brazing filler metal (BCup Series) without flux. Dissimilar metals such as copper and bronze or brass shall be brazed using an appropriate flux with a silver (BAg Series) brazing filler metal.
      a. In lieu of brazing, domestic cold and hot water piping 4" and larger may be joined with rolled grooved copper fittings and valves by Victaulic or Anvil, copper pipe grooved systems.

C. Bracing Joints:
   1. Provide braces and bridle rods as required to reinforce joints.
   2. If mechanical couplings are used, then prepare pipe ends and make joints in accordance with pipe coupling manufacturer's printed instructions.
   3. Where large pipes underground are subject to shock because of sudden changes in liquid flow rate, provide concrete "kicker" blocks at joints, fittings, and changes of pipe direction. Provide "kicker" blocks in accordance with applicable pipe industry trade or research organization recommendations.
      a. For example, for ductile iron pipe follow recommendations of Ductile Iron Pipe Research Association.

3.03 ESCUTCHEONS

A. Provide chrome plated escutcheons where uninsulated pipes penetrate walls or ceilings of finished spaces.

3.04 AIR VENTING

A. Provide manually operated air vents at high points in vertical risers to eliminate air from systems.

B. Use ball valves for manual air vents.

3.05 VALVE ACCESS

A. Locate ceiling/wall access panels at shut-off and control valves for proper access and operation. Furnish and install access doors in accordance with Section 22 05 00 and other Divisions as applicable.

3.06 TESTING

A. Before piping is concealed or insulated, recheck it for leaks.

B. Rework or replace defective and leaking joints, and joints which are otherwise unsatisfactory. Preening, caulking, and doping are not permitted.

END OF SECTION

SECTION 22 11 19

DOMESTIC WATER PIPING SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes requirements for:
   1. Shock arrestors.
   2. Trap primers.
   3. Domestic water service connection.

1.02 RELATED WORK

A. Section 22 05 00: Common Work Results for Plumbing

B. Section 22 05 23: Valves for Plumbing Piping

C. Section 22 07 00: Plumbing Insulation

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are indicated in subsequent paragraphs.

2.02 SHOCK ARRESTORS

A. Acceptable manufacturers:
   1. Josam
   2. Wade
   3. Jay R. Smith
   4. Precision Products
   5. Zurn
   6. Sioux Chief

2.03 DOMESTIC WATER SERVICE CONNECTION

A. Provide tapping sleeve and valves for connection to existing water mains.

B. Provide domestic water meters, gate valves, check valves, bypass feature, and meter pit per local utility company standards.

PART 3 EXECUTION

3.01 INSTALLATION AND TESTING

A. Shock Arrestors:
   1. Install shock arrestors at each quick closing valves, solenoid type valves, and flush valves. Size shock arrestors in accordance with manufacturer's instructions.
   2. Install shock arrestors within five feet of valve, provide wall access panel as required.
   3. Test and certify shock arrestors by Plumbing and Drainage Institute.

B. Domestic Water Service Connection
   1. Arrange and coordinate with local utility company for service connection, meter type and manufacturer, fees, permits, etc.
   2. Field verify exact location, size, pressure, and elevation of existing water main.
   3. Flush system and test at 200 PSI for 24 hours without any leaks.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1- GENERAL

A. RELATED WORK

B. Section 22 05 00: Common Work Results for Plumbing

1.01 SUBMITTALS

A. Submit product data for review on piping and fittings. Submittal data shall include:
   1. Manufacturer of pipe.
   2. Tests or listing by recognized testing laboratory that certifies material composition is in accordance with ANSI/ASTM requirements.
   3. Product data for pipe and fittings to be used on each piping system.

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 CAST IRON SOIL AND VENT PIPE

A. Conform to ASTM A-74, A-888, and CISPI 301,310.

B. Standard weight pipe with drainage fittings for:
   1. Sanitary waste, vent, and drainage pipe 2" and larger above ground.
   2. Drain lines under buildings, and under exterior concrete or other paving. Extend cast iron piping at least 5 feet outside of building.

C. Joints in Cast Iron Pipe:
   1. Below grade: Bell and spigot with neoprene compression gaskets
   2. Above grade: No-Hub using stainless couplings, meeting CISPI 310-90

2.02 PVC PIPE AND FITTINGS

A. Polyvinyl chloride sewer pipe and fittings (4" to 15" diameters) shall be as manufactured by H and W Industries or equal.

B. PVC pipe, fittings, cement, and joint cleaner for entire project shall be supplied by a single manufacturer.

C. PVC schedule 40, Type I, DWV, ASTM D-2665, 1120, 160 PSI at 73 degrees F. Solvent cement shall meet ASTM No. D-2564 for (PVC-DWV) plastic and pipe fittings. If permitted by governing code authority, may be used for:
   1. Inside gravity, under floor slab sanitary and storm waste drainage systems, with waste temperatures below 140 degrees F.

D. CPVC schedule 80, ASTM D-2846, 230 psi at 73 degrees F. Solvent cement shall meet ASTM No. F-493 for chlorinated polyvinyl chloride (CPVC) plastic pipe and fittings. If permitted by governing code authority, may be used for:
   1. Inside gravity, under floor slab sanitary waste drainage systems, where temperature of waste discharged into drainage system exceeds 140 degrees F.

E. PVC schedule 40, Type-PSM, Sewer Pipe, ASTM D-3034 with SDR as gasketed slip type joints. Provide coupling with a rubber ring seal for use in each manhole entry to ensure a surface for adherence of concrete to manhole wall. If permitted by governing code authority, may be used for:
   1. Outside gravity, underground sanitary sewer drainage piping, from 5'0" outside the building to the connections point to local municipality.

F. Fittings:
   1. Permanently identify each fitting in accordance with MSS-SP-2241, and with manufacturer's trademark.
   2. Include certification with submittal data that fittings and flanges meet applicable requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. PVC Joints:
   1. Make joints in accordance with cement manufacturer's printed instructions.

B. Cast Iron Pipe Joints:
   1. Install compression gaskets and No-Hub bands in accordance with CISPI installation methods and manufacturer's instructions.

END OF SECTION

SECTION 22 13 19

SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes requirements for:
   1. Cleanouts
   2. Trap primers
   3. Sanitary sewer service connection

1.02 RELATED WORK

A. Section 22 05 00: Common Work Results for Plumbing

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are indicated in subsequent paragraphs.

2.02 CLEANOUTS

A. Acceptable manufacturers:
   1. Jay R. Smith (Jay R. Smith model numbers are used below)
   2. Josam
   3. Wade
   4. Zurn
   5. Sioux Chief
   6. Watts

B. Exterior: 4250 Series heavy duty cast iron cleanout housing with internal cleanout body and plug.

C. Finished concrete floor: 4031-PB cast iron body with round adjustable polished nickel bronze top, ABS plug and carpet marker where required.

D. Ceramic tile: 4919 PB series, cast iron body, polished nickel bronze top, 1/2" terrazzo recess and closure plug.

E. Vinyl tile floor: 4151PB series, cast iron body, round nickel bronze top, 1/8" tile recess and closure plug.

F. Carpet: 4031-PBY. Inside caulk round brass scoriated frame and cover and provide carpet marker.

G. Wall: 4422. Cast iron caulking ferrule with stainless round access cover and screws.

H. Access covers: Minimum size 12" x 12" located for access to valves, shock absorbers, trap primers, wall cleanouts, etc.

I. Furnish cleanouts occurring in waterproof floors with clamping devices.

2.03 TRAP PRIMERS

A. Acceptable manufacturers:
   1. Josam
   2. Zurn
   3. Wade
   4. Jay R. Smith
   5. Precision Plumbing Products
   6. MIFAB

B. Provide trap primer of brass construction, with removable operating parts, and integral vacuum breaker.

2.04 SANITARY SEWER SERVICE CONNECTION

A. Provide saddle, cut-in wyes, and/or connection to existing manhole per local utility company standard.

PART 3 EXECUTION

3.01 INSTALLATION AND TESTING

A. Cleanouts
   1. Provide line size cleanouts up to 4"; 4" cleanout for lines larger than 4".
   2. Locate cleanouts at all changes in direction greater than 45 degrees and in straight runs as shown 100 feet outside the building on drawing or spaced not greater than required by applicable Plumbing Code.
   3. Extend inaccessible cleanouts up through floor and/or wall to provide easy accessibility.

B. Trap Primers
   1. Install primers in accessible location or as shown on drawings.
   2. Trap primers shall be Plumbing and Drainage Institute approved.

C. Sanitary Sewer Service Connection
   1. Arrange and coordinate with local utility company for service connection, fees, permits, etc.
   2. Field verify exact location, size, and elevation of existing sewer.
   3. Flush system, fill with water and let stand with a minimum 10 feet of head for 24 hours without any leaks.

END OF SECTION

SECTION 22 33 36

WATER HEATER - ELECTRIC

PART 1- GENERAL

1.01 RELATED WORK

A. Section 22 07 00: Plumbing Insulation

B. Section 22 11 16: Domestic Water Piping

C. Division 26: Electrical

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Lochinvar

B. Bradford White

C. Hesco, Inc

D. A. O. Smith

E. State Industries

F. Rheem/Rudd

2.02 EQUIPMENT

A. Storage tank: 300 psi tested, 150 psi working pressure. ASME stamped and National Board listed. Tank lining: Vitreous glass, polymerized epoxy, or silica cement. Provide 12" x 16" manway on heater 125 gallon and larger.

B. Provide the following features:
   1. Internal fusing for control and load circuits
   2. Incoloy sheath elements
   3. ASME rated temperature and pressure relief valve
   4. Pressure and temperature gauges
   5. Terminal block wiring
   6. Rated for 180 degrees F. water temperature
   7. U.L. Listing
   8. 5 year tank warranty
   9. Element control through thermostatic or solid state step proportional sequencers

10. High density anode rods

C. Safety controls:
   1. Electronic low water cut-off
   2. High/low water pressure cut-off
   3. Fused and switched, 120 volt control circuit

D. Operating and maintenance instructions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Verify location and clearance requirements.

B. Install in accordance with manufacturer's recommendations and contract drawings.

C. Insulation for water connections as specified in Section 22 07 00.

D. Install electric connections under Division 26.

E. Clean and test unit as required by Sections 22 05 00.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with provisions of Section 22 05 00.

B. Provide plumbing fixtures, trim and related items such as supplies, traps, drains, cleanouts, water closet flanges, bolts, seats and covers, fixture supports and other accessory items.

C. Coordinate fixture requirements by reviewing architectural, structural, and equipment drawings. Install fixtures in accordance with Contract Drawings and manufacturer's rough-in drawings.

1.02 RELATED WORK

A. Section 22 13 19: Sanitary Waste Piping Specialties

B. Section 22 11 16: Domestic Water Piping

1.03 CODES AND STANDARDS

A. Perform work in accordance with applicable codes and standards enforced by local authorities.

B. All barrier free fixtures shall be installed in accordance with the Americans with Disabilities Act (ADA) Rules and Regulations.

1.04 SUBMITTALS

A. Submit manufacturer's product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Fixtures: Kohler, American Standard, Crane, Eljer, Toto.

B. Brass Trim: McGuire Engineered Brass Company, Cambridge Brass,

C. Hydrant, floor drains, shock absorbers, carriers and p-traps: Jay R. Smith, Zurn, Wade, Josam, Watts.

D. Flush valves: Flush valves: Sloan Royal, Zurn Z-6000AV with low force handles for ADA compliance.

E. Toilet seats: Olsmite, Beneke, Bemis, Church.

F. Faucets: T&S Brass, Delta HDF Water Saver, Chicago Faucet Company, Cambridge Brass, Kohler, Zurn.

G. Stainless steel sinks: Elkay, Just, Kohler.

H. Flow control devices: Dole Flow Controls Company.

I. Pre-fabricated insulation on water lines and p-trap under barrier free lavatories and sinks: Brocar Products, Inc. Inc. Trap Wrap TrueBro, Inc. Handi Lav-Guard McGuire Pro-wrap.

J. Faucets and flush valves shall meet code and state requirements for water conservation on low consumption fixtures.

K. Provide fixtures and trim as a complete unit as required in the individual "P" numbers listed below.

2.02 MATERIALS

A. Wall hung lavatories: Furnish complete with wall mounting brackets.

B. Countertop sinks: Furnished complete with mounting rings where required.

C. Fixture color: White unless specified otherwise.

D. Faucets and flush valves: Provide either integral or attached supply stops with nipples.

E. Clamping device: Provide for drains installed in slabs above grade.

F. Trap primer: Provide connections for floor drain as shown on drawings.

G. Caulking: General Electric silicon sanitary sealant or equal.

H. Provide Zurn ZR-1231 floor mounted carrier for wall hung lavatories.

I. Provide FRT wood or metal backing at wall fixtures and fixture trim connections so piping and connecting faucets and valves are rigid to wall.

J. Wrist blade operation:
   1. Pull wrist blade to operator to turn on
   2. Push toward splashback to turn off faucet

K. All fixtures and fittings relating to drinking water shall meet the requirement of ANSI/NSF 61, Section 9. Any faucet for drinking water shall be certified by U.L. to the ANSI/NSF 61, Section 9 standards.

2.03 PLUMBING FIXTURES

P-1 WATER CLOSET (FLOOR MOUNTED-FLUSH VALVE (1.6 GPF)
   a. Fixture: K-4350 white elongated bowl

b. Valve: Sloan #111YB 1.6 gallon per flush
c. Trim: Two bolt caps included
d. Seat: Kohler K-4620-C white open front

P-2 WATER CLOSET (FLOOR MOUNTED-FLUSH VALVE - BARRIER FREE - 1.6 GPF)
a. Fixture: Kohler #K-4368, white elongated bowl
b. Valve: Sloan #111YB, 1.6 gallon per flush
c. Seat: Kohler K-4670 white open front
d. Trim: Two bolt caps included

P-3 URINAL (WALL HUNG-FLUSH VALVE)
a. Fixture: Kohler K4960-T, White, elongated rim
b. Valve: Sloan Royal 186-1-YBYC
c. Mounting: 24 inches from finished floor to flood rim

P-4 URINAL (WALL HUNG-FLUSH VALVE-BARRIER FREE)
a. Fixture: Kohler K-5016-T, White, elongated rim
b. Valve: Sloan Royal 180-1-YBYC
c. Mounting: 17 inches from finished floor to flood rim

P-5 LAVATORY (OVAL-DROP IN-SINGLE LEVER)
a. Fixture: Kohler K-2196-4, 20 inches by 17 inches
b. Faucet: Kohler K-15592-5 with McGuire 155-A grid drain
c. Trim: McGuire 2165 supplies with wheel handle stops. One McGuire 8872 1-1/4 inch semi-cast brass P-trap

P-6 LAVATORY (OVAL-DROP IN-OVAL-SINGLE LEVER-BARRIER FREE)
a. Fixture: Kohler K-2196-4, 20"x17"
b. Faucet: Kohler K-15593-5
c. Trim: One McGuire 155-WC 1-1/4 inch grid drain and tailpiece. McGuire 2165 supplies with wheel handle stops. One McGuire 8872 1-1/4 inch semi-cast brass P-trap
d. Mounting: See Architectural Drawings for counter height. Insulate hot water piping and P-trap under sink. Install 5" from counter front to edge of lavatory for ADA compliance

P-7 SINK (S.S. SINGLE COMPARTMENT)
a. Fixture: Just SLX-2017-A-GR, 20"x17"x10.5"
b. Faucet: Kohler K-15171, single lever faucet with K-18036 aerator
c. Trim: One McGuire 151 drain with 1-1/2 inch tailpiece. McGuire 2165 supplies with wheel handle stops. One McGuire 8912 1-1/2 inch by 1-1/2 inch semi-cast brass P-trap

P-8 JANITORS FLOOR BASIN
a. Fixture: Stein-Williams terrazzo SB-900, 24"x24"x12" with stainless steel cap, less tiling flanges
b. Faucet: T. & S. B-695 with vacuum breaker.
c. Mounting: Mount faucet 36 inches above finished floor. Mount vacuum breaker 7 feet 6 inches above finished floor

P-9 SHOCK ABSORBER
- a. Fixture: Jay R. Smith 5005 through 5050 size as recommended by manufacturer

P-10 WATER COOLER FOUNTAIN (WALL HUNG - BARRIER FREE)
- a. Fixture: Sunroc HCWC-8-SS with stainless steel apron
- b. Trim: One McGuire 2165 supply with wheel handle stop. One McGuire 8872 1-1/4 inch semi-cast brass P-trap
- c. Capacity: 8 GPH at 90 degree room temperature
- d. Mounting: 36 inches from bubbler to finished floor

P-11 FLOOR DRAIN (REGULAR-GENERAL PURPOSE)
- a. Fixture: Jay R. Smith 2005-A-B cast iron floor with sediment bucket and polished nickel bronze top, adjustable, strainer and flashing clamp device. Size of drain as shown on drawings.

P-12 FLOOR DRAIN (EQUIPMENT ROOMS)
- a. Fixture: Jay R. Smith 2233 round, cast iron, 12" diameter drain with sediment bucket, flange and clamp device. Size of drain as shown on drawings.

P-13 TRAP PRIMER (FLOOR DRAIN CONNECTION)
- a. Fixture: Precision Plumbing Products Model P-1 and P-2, sized as required for the number of floor drains served, with trap primer valve and distribution unit.

P-14 WALL HYDRANT (NON-FREEZE, KEY OPERATED)
- a. Fixture: Jay R. Smith #5609-NB "line-gard", anti-siphon non-freeze wall hydrant, cast brass, nickel bronze face, with integral vacuum breaker. Mounting: 18" from center line of hydrant to finished grade.

P-15 HOSE BIBB (COLD WATER - EQUIPMENT ROOMS)
- a. Fixture: Woodford #24P-1/2 with vacuum breaker, rough brass finish.

PART 3 EXECUTION

3.01 INSTALLATION

A. Connect to plumbing fixtures and equipment provided under this and other sections of specification, architectural drawings, and manufacturer's shop drawings. Provide rough-in connections as shown on drawings.

B. Use schedule and details on drawings or manufacturer's shop drawings for connection sizes to fixtures.

C. Connect wall hung urinals to waste piping with red brass nipples.

D. Provide separate p-trap for each fixture, floor drain, and piece of equipment.

E. Provide cast iron p-traps under floor drains.

F. Install barrier free fixtures in accordance with rules and regulations of the Americans with Disabilities Act (ADA).

G. Provide outlet devices which limit the flow of hot water to lavatories and sinks to a minimum of 0.5 GPM, sized as recommended by the manufacturer and as required under ASHRAE Standard 90-75, paragraph 7.7.2 or local or state energy codes.

H. Install lavatories and sinks with a minimum of 4" clearance on each side, from a wall or partition.

I. Install water closets with a minimum of 15" clearance from the centerline of the bowl to each side, from a wall, partition, divider, or another fixture.

J. Water closets shall have a minimum of 21" clearance in front of bowl.

K. Coordinate dimensions required for minimum fixture clearances with other Divisions.

L. Add trap primer connection to floor drain if required. (See drawing for requirement)

M. Caulk around joints at fixtures mounted on wall or floor, or backed up to walls.

N. Mount fixtures rigid to walls as shown on drawings or details.

O. Flush valves: Install flush valves on wide side of water closet as required for ADA accessibility.

P. Run connection size cold water line to back of refrigerator and connect with cutoff valve at connection point. Field verify exact connections required.

3.02 TESTING AND CLEANING

A. Inspect and test all work to insure that it is installed in accordance with drawings and specification and is functioning as designed. Test procedures and pressure as required by other sections.

B. Correct all deficiencies found and retest.

C. Turn all work over to Owner in a clean, sanitary condition.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic materials and methods, along with Division 01, General Requirements, that are applicable to Division 26 sections.

B. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 specification Sections apply to all Division 26 sections.

1.02 QUALITY ASSURANCE

A. Comply with applicable local, state, and federal codes.

B. Warrant electrical Work against faulty material or Workmanship in accordance with Division 01. If the Project is occupied or the systems placed in operation in several phases at the request of the Owner's Representative, then the warranty of each system or piece of equipment used, shall begin on the date each system or piece of equipment was placed in satisfactory operation and accepted as such, in writing, by the Owner's Representative. The use of building equipment for temporary service and testing does not constitute the beginning of the warranty.

C. Equipment and material provided under this Division shall be periodically inspected and serviced by competent mechanics. This function becomes the responsibility of the Owner's Representative when the system is accepted by the Owner's Representative. The one year material and Workmanship warranty is not intended to supplant normal inspection or service and shall not be construed to mean the Contractor shall provide free service for normal maintenance items such as periodic lubrication and adjustment due to normal use, nor to correct without charge, breakage, maladjustment, and other trouble caused by improper maintenance.

D. Turn over electrical equipment provided under this Division to the Owner's Representative in lubricated condition. Include instructions on further lubrication in the operating manual.

E. Upon completion of contract and progressively as work proceeds, clean-up and remove dirt, debris and scrap materials. Maintain premises neat and clean. Protect and preserve access to energized equipment at all times. Clean items with factory finishes. Touch-up minor damage to surfaces; refinish entire piece of equipment when sustained major damage. Use only factory supplied paints of matching color and formula. Schedule an off-hour shutdown of all electrical equipment during the 2-week period preceding substantial completion. During this shut down, clean all buses and insulators inside all switchgear, switchboards, bus ducts, collector buses and panelboards located inside or adjacent to the project limits.

1.03 REGULATORY REQUIREMENTS

A. Perform Work specified in Division 26 in accordance with standards listed below of the latest applicable edition adopted by the authority having jurisdiction. Where these Specifications are more stringent, they shall take precedence. In case of conflict, obtain a decision from the Architect,.
   1. NFPA-70: National Electrical Code
   2. NFPA-72: National Fire Alarm Code
   3. NFPA 90A: Standard for the Installation of Air Conditioning and Ventilating Systems
   4. NFPA 90B: Standard for the Installation of Warm Air Heating and Air Conditioning Systems
   5. NFPA 92A: Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences
   6. NFPA-101: Life Safety Code
   7. NFPA 241: Standard for Safeguarding Building Construction, Alterations, and Demolition Operations
   8. NFPA-780: Standard for the Installation of Lightning Protection Systems
   9. NFPA 5000: Building Construction and Safety Code
   10. ANSI Handicapped Code-A117.1
   11. UL White Book: General information for electrical construction, hazardous location, and electrical heating and air conditioning equipment
   12. International Building Code
   13. State of Tennessee Electrical Code (with all local amendments)
   14. All applicable Occupational Safety and Health Administration (0SHA) Publications, Rules and Regulations.
   15. Americans with Disabilities Act (ADA).

1.04 RELATED WORK SPECIFIED UNDER OTHER DIVISIONS

A. Foundations and pads required for equipment furnished under this Division

B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting

C. Flashing of conduits into roofing and outside walls

D. Heating, ventilating, and air conditioning equipment

E. Plumbing equipment

F. Fireproofing

G. Automatic Doors

H. Cutting and patching for electrical Work, except for errors and omissions under this Division.

1.05 RELATED WORK - OWNER FURNISHED EQUIPMENT AND SYSTEMS

A. Security System Equipment

B. Data Processing System Equipment

1.06 SUBMITTALS

A. Comply with provisions of Division 01.

B. Submit product data, equipment details, capacities, and shop drawings as specified in sections of this Division.

C. Submit fire alarm point-to-point drawings with product data submission.

D. Submit dimensioned equipment room layouts.
   1. Show location of all electrical equipment in rooms including but not limited to:
      a. Electrical rooms and closets
      b. Mechanical Rooms
   2. Draw room layouts to 1/4" scale, with equipment locations shown therein. Clearances shall be in accordance with NEC and local codes. Indicate on drawing the mechanical equipment and mechanical and sprinkler pipe routing.
   3. Electrical equipment submittals will be rejected without dimensioned equipment room or equipment location layouts.

1.07 OPERATING AND MAINTENANCE MANUALS

A. Provide manuals in accordance with Division 01.

B. In addition to required submittals, include copies of all test reports required in Part 3, "Execution" of section 26 05 00.

C. Provide completed warranty certificates for systems and equipment.

D. Provide tabulation of overload heaters, including each motor identified, nameplate data and o/l heater part number.

1.08 DELIVERY AND STORAGE

A. Insofar as possible, deliver items in manufacturer's original unopened packaging. Where this is not practical, cover items with protective materials to keep them from being damaged. Use care in loading, transporting, unloading, and storage to keep items from being damaged.

B. Store items in a clean dry place and protect from damage. Evidence of damage from water or other contaminants will be cause for rejection.

1.09 RECORD DRAWINGS

A. Comply with provisions of Division 01.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Equipment and materials furnished shall be listed by UL or other nationally accredited testing laboratory where available. When listing is not available for a piece of equipment, it shall be submitted in accordance with Drawings and Specifications and shall be approved by the authorities having jurisdiction.

B. Specifications and Drawings indicate name, type and/or catalog number of materials and equipment to establish standards of quality. Submittals shall be based on the standards specified. The standards should not be construed as limiting competition.

C. If materials and equipment other than specified herein are intended to be submitted, a letter providing a list of all the suggested alternates by section number, brand and series or model shall be submitted to the prime Architect for review and approval. Submit in accordance with Division 01 or 14 days prior to bids or final pricing are to be submitted.

2.02 FUSES

A. Provide fuses as scheduled on Drawings for switchboards, power panelboards and disconnecting switches.

B. Acceptable manufacturers: Bussmann; Gould Shawmut; Littelfuse, Inc

C. Provide fuses of one manufacturer only. Place the same type fuse in each pole of a switch.

D. Use these types:
   1. Class J-Time Delay-1A-600A; Switchboards, motor loads
   2. Class J-Fast Acting-1A-600A; Switchboards, other loads
   3. Class RK5-Time Delay-1/10A-600A; Power panels and fusible switches, motor loads
   4. Class RK1-Fast Acting-1A-600A; Power panels and fusible switches, other loads

E. Provide a manufactured fuse storage cabinet, mounted on wall in main electrical room, complete with one set (3 fuses) of spare fuses for each type and rating installed in this Project.

2.03 WALL AND CEILING ACCESS PANELS

A. Style and type as required for material in which installed.
   1. Size: 16" X 16" minimum, as indicated, or as required to allow inspection, service and removal of items served
   2. 14 gauge minimum sheet metal for doors, 16 gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction
   3. Panels shall have spring hinges with screwdriver locks in non-public areas. Key lock, keyed alike, for panels in public areas
   4. Prime painted or rust inhibitive paint finish
   5. UL labeled when in fire-rated construction, 1 1/2 hour rating

6. Provide in walls, floors, and ceilings to permit access to all equipment and junction boxes.
7. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.
8. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers. Use panels equal to Milcor Style M for masonry and drywall construction; equal to Milcor Style K for plastered masonry walls and ceilings. Stainless steel panels shall be used in ceramic tile or glazed structural tile

PART 3 EXECUTION

3.01 COORDINATION

A. Install equipment in accordance with manufacturer's recommendations. Where conflicts occur between Contract Documents and these recommendations, request a ruling before proceeding with such Work.

B. Visit site and observe conditions under which work must be performed. No subsequent allowance will be made because of error or failure to obtain necessary information to completely estimate and perform work required by these documents.

C. Examine Specifications and Drawings to be familiar with items which require electrical connections and coordination. Electrical Drawings are diagrammatic and shall not be scaled for exact sizes.

D. Prior to commencement of installation, prepare coordination drawings for work under this division, as specified in Division 01 and as called for herein. Coordinate work in full cooperation with persons performing work under other divisions, including but not limited to mechanical, plumbing, fire protection, telecommunication and miscellaneous steel to develop these coordination drawings that will serve as the agreed upon plan for a coordinated installation of work for all trades. Include electrical equipment, switchgear, panelboards, starters, disconnect switches, cable tray, conduit racks and conduits 3" and larger on drawings confirming coordination with other trades. Incorporate the information onto the coordination drawings required under Division 01 and 23 to develop master coordination drawings. Account for lighting fixture depths in the coordination. Inform Design Professional of conflicts that cannot be resolved.

E. Drawings are not to be submitted to Engineer. Submit a copy to the General Contractor and keep a copy on site for references. Notify design professional of conflicts that cannot be resolved.

3.02 FEES AND PERMITS

A. Obtain and pay for all necessary permits and inspection fees required for electrical installation.

3.03 TEMPORARY LIGHTS AND POWER

A. Comply with provisions of Division 01.

B. Provide a temporary electrical lighting and power distribution system of adequate size to properly serve the following requirements, including adequate feeder sizes to prevent excessive voltage drop. Temporary Work shall be installed in a neat and safe manner in accordance with the National Electrical Code, Article 305, NFPA 241, and as required by OSHA or applicable local safety codes.

C. Provide one pigtail socket with 150 watt lamp, CFL medium base, for every 1,000 square feet of floor area, evenly distributed throughout the building and with minimum of one pigtail socket per room.

D. Provide suitable guards for temporary lights to prevent accidental contact with lamps.

E. Provide a minimum of one GFCI-protected duplex power outlet for every 1,500 square feet of floor area, evenly distributed throughout the building. Power outlets shall be GFCI-protected duplex 20 amp, 120 volt.

F. Provide feeders, disconnects, connections, etc., required for construction equipment, e.g.: cranes, pumps, etc.

G. Prior to installation, determine if any lighting or power outlets over the minimum quantity noted above are required and if so, provide them.

H. Provide service and panelboards required for above lighting and power outlets.

I. Requirement for payment of utility bills during construction are specified in Division 01.

J. Provide single phase and three phase service as required by Project.

K. Remove temporary wiring upon completion of use.

3.04 CUTTING AND PATCHING

A. Comply with provisions of Division 01

B. Repair or replace routine damage caused by cutting in performance of Work under this Division.

C. Correct unnecessary damage caused due to installation of electrical Work, brought about through carelessness or lack of coordination.

D. Holes cut through floor slabs shall be core drilled with drill designed for this purpose. All openings, sleeves, and holes in slabs between floors shall be properly sealed, fire proofed and water proofed.

E. Holes cut through walls shall be drilled or cut with tools designed for the purpose. All openings, sleeves and holes in walls that extend to underside of floor above shall be properly sealed and fire proofed.

F. Repairs shall be performed with materials which match existing materials and be installed in accordance with appropriate sections of these Specifications.

G. Contractor shall not be permitted to cut or modify any structural members without the written permission of the Architect.

3.05 TRENCHING, EXCAVATION, BACKFILLING, AND REPAIRS

A. Comply with provisions of Division 31.

B. Provide trenching, excavation, and backfilling necessary for performance of Work under this Division.

C. Provide sheathing, shoring, dewatering, and cleaning necessary to keep trenches and their grades in proper condition for Work to be performed.

D. Trenching and excavation shall be unclassified. No extra will be paid in event that rock is encountered.

3.06 FOUNDATIONS AND PADS

A. Provide concrete foundations and pads for equipment per the requirements Division 03. Locate and size foundations, pads, and anchor bolts as required for equipment in this Division.

B. Provide concrete foundations and pads as required for electrical utility company's equipment such as transformers, CT cabinets, metering cabinets, switches, fused disconnects, and circuit breakers. All work shall be in compliance with the utility company's specifications.

3.07 CONTROL SYSTEMS AND INTERLOCK WIRING

A. Control systems, components and control and interlock wiring for mechanical equipment will be furnished under Divisions 22 and 23. Control devices including, but not limited to VFD's, thermostats, fan speed and level control switches, relays and electro-pneumatic switches shall be furnished under Divisions 22 and 23.

B. Provide magnetic starters per section 26 29 13.

C. Provide manual motor starters per Section 26 29 13.

D. Provide power wiring to starters and contactors under Division 26. Power wiring to magnetic starters shall consist of wiring to the line side terminals of the magnetic starter or contactor and wiring away from the load side terminals to the equipment, except where such wiring is installed pre-wired by the equipment vendor.
   1. Power wiring to 120V, 1-phase, 60 Hz and 277V, 1-phase, 60 Hz volt fans, unit heaters, fan-coil units and pumps shall include all portions of the branch circuit, except wiring inside an automatic temperature control panel (ATC) or Direct Digital Control Panel (DDC) or magnetic starter. Such internal wiring shall be furnished under Divisions 22 & 23.

E. Under Division 28:
   1. Furnish duct mounted smoke detectors.

2. Provide wiring among detectors, fire alarm system, magnetic starters and relays, ATC panels and DDC panels

F. See Building Automation System sections of Division 23.

3.08 UTILITY COMPANY COORDINATION

A. Coordinate with the serving utility company as to all types of work required to be done by the contractor for utility equipment.

B. Confirm exact location of point of common coupling, duct banks, pads, etc.

C. Obtain copies of all pertinent utility company specifications relating to duct banks, concrete pads, raceways, and cable that are contractor installed for the utility company use. Maintain copies at project site.

D. Install at components in compliance with utility company specifications and project specifications.

3.09 TESTING ELECTRICAL SYSTEMS

A. On completion of work, installation shall be completely operational and entirely free from grounds, short circuits, and open circuits. Perform operational tests as required to demonstrate substantial completion of the Work. Balance circuits so that feeders to panels are not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests. All ampere readings shall be made with a true RMS reading meter.

B. Perform megger tests of all service entrance circuits, feeder and branch circuits size #4 AWG and larger. Provide a report of all such megger test results.

C. Furnish the DESIGN PROFESSIONAL a copy of test reports and required certification including but not limited to the following:
1. Service ground resistance test
2. Switchboard and panelboard load test - include ampere readings of all panels and major circuit breakers
3. Ground Fault Test
4. Fire Alarm System Certification
5. Megger test results
6. Power System Analysis Report

D. Prior to final observation and acceptance test, install all electrical systems and equipment complete and in satisfactory operating condition.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide a complete system of conductors for lighting, power, and systems throughout the project.

1.02 RELATED WORK

A. Section 26 05 33: Raceways and Boxes for Electrical Systems

B. Section 26 05 43: Underground Ducts and Raceways for Electrical Systems

1.03 REFERENCES

A. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

B. ANSI/UL 83 - Thermoplastic-Insulated Wire and Cables

C. NFPA 70 - National Electrical Code, latest edition

1.04 SUBMITTALS

A. Submit the data sheets for products furnished under this Section.

1.05 DELIVERY, STORAGE AND HANDLING

A. Provide factory-wrapped waterproof flexible barrier material for covering wire and cable wood reels, where applicable, and weather resistant fiberboard containers for factory packaging of cable, wire and connectors, to protect against physical damage in transit. Damaged cable, wire or connectors shall be removed from project site.

B. In their factory-furnished coverings, store cable, wire and connectors in a clean, dry indoor space, which provides protection against the weather.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. American Insulated Wire

B. United Copper

C. Encore

D. Republic Wire

E. Southwire

F. Superior Essex

G. Cerrowire

2.02 CONDUCTORS

A. Provide 98% conductivity copper conductors with 600V insulation.

B. For conductors No. 12 AWG and No. 10 AWG, provide solid type THWN or THHN.

C. For conductors No. 14 AWG and smaller, provide solid type THHN.

D. For conductors No. 8 AWG and larger, provide stranded type THHN, or THWN applied consistently with insulation ratings and NEC requirements.

E. Provide white or gray colored neutral conductors; provide color coded phase conductors.

F. Minimum conductor size shall be:
   1. #12 for power wiring
   2. #14 for hard wired controls unless otherwise specified

G. Fire alarm wire and cable shall meet the requirements of NFPA 70, Article 760. Where required by code and other sections of the specification, fire alarm wire and cable shall be UL listed as Fire Alarm Circuit Integrity Cable (CI Cable).

H. Provide digital communication, network cabling, and other low voltage systems wiring as directed elsewhere in this specification.

PART 3 EXECUTION

3.01 INSTALLATION

A. Conductors shall be continuous from origin to panel or equipment termination without splices. Where splices and taps are necessary or required, they shall be made in splice boxes.

B. Install pull boxes in circuits or feeders over 100' long.

C. Make splices and connections only in outlet, pull or junction boxes. Twist conductors together before installing wire nuts or connectors.

D. Use powdered soapstone or pulling compound to pull conductors.

E. Deliver conductors to jobsite new and in original wrapping, package or reel.

F. Conductors and connections shall test free of grounds, shorts, and opens.

G. Provide No. 10 wire in lieu of No. 12 wire for any branch circuit in excess of 100 feet (120V) or 150 feet (277V) of circuit length to farthest device to prevent excessive voltage drop.

H. Use Ideal wire nuts, Scotchlok Type Y, R, G, or B connectors for fixture connections at outlet boxes.

I. Make feeder taps and joints with approved compression sleeves. Insulate sleeves with heat shrink tubing, rated 600V, 90 degree C., containing factory applied sealant.

J. Leave a minimum of 8" slack wire in every outlet box whether it be in use or left for future use.

K. Color code conductors as follows:
   1. 120/208 Volt Systems:
      a. Phase A - Black
      b. Phase B - Red
      c. Phase C - Blue
      d. Neutral - White
      e. Ground - Green
      f. Isolated Ground - Green with Yellow stripe
   2. 277/480 Volt Systems:
      a. Phase A - Brown
      b. Phase B - Orange
      c. Phase B - Purple
      d. Phase C - Yellow
      e. Neutral - Gray
      f. Ground - Green

L. Use factory color coded conductors where commercially available. If not available, use black conductors and band with color tape.

M. Install in each branch-circuit panelboard a legend explaining color code for ungrounded conductors.

N. Complete conduit system, including bushings, before pulling wire and cable.

O. Maintain separation of electric light, power, Class 1, 2 and 3 wiring throughout raceway systems. Comply with requirements of NFPA-70, paragraphs 300-3, 725-15 and 725-54.

3.02 FIELD TESTING

A. Visually check wire, cable, and connectors for physical damage and proper installation.

B. Check continuity of wire and cable using a low voltage DC tester.

C. Check for proper torque on all mechanical connections.

D. Perform a 1000 VDC megger test on all 600 volt insulated wire or cable #4 AWG and larger. Check each wire to ground and to all other wires in the same cable or conduit by

connecting each wire not under test together and to ground. Wire or cable shall be disconnected at each end and protected from current leakage during testing.

1. Service entrance circuits and feeder (600A & smaller) circuits and branch circuits
    a. Use either a motor driven (Biddle 359) or a hand crank (Biddle MJ159) megger
    b. Perform a dielectric absorption ratio test using a 60-second test period. Record the megohm readings at 30 seconds and 60 seconds. Calculate the dielectric absorption ratio (60 sec / 30 sec readings) and record

E. Provide 8 copies of the megger test report to the Engineer. The report shall be in a tabulated format and shall include the following as a minimum.
    1. Circuit identification
    2. Type of raceway
    3. Approximate length of circuit
    4. Megohm readings
    5. Polarization index or dielectric absorption ratio
    6. Ambient temperature
    7. Approximate humidity (dry, average, or humid)

F. Results
    1. Acceptable
        a. Megohms greater than (1.6 x 1000 / length)
        b. Polarization index greater than 2.0 or a dielectric absorption ratio greater than 1.4
    2. Questionable (must be discussed with Engineer)
        a. Polarization index 1.0 less than 2.0 or a dielectric absorption ration 1.0 less than 1.4
    3. Unacceptable (wire or cable must be replaced)
        a. Megohms less than (1.6 x 1000 / length)
        b. Polarization index less than 1.0 or a dielectric absorption ration less than 1.0

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. The entire system of raceways and equipment shall be grounded in accordance with Articles 250 and 517 of the National Electrical Code and any local regulation or governing authority.

1.02 SUBMITTALS

A. Submittals are not required for products in this Section.

PART 2 PRODUCTS

2.01 REQUIREMENTS

A. Ground clamps: OZ Electrical Manufacturing Company Type "CG", or equal by Steel City or Appleton.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. General
   1. Clean all conductive surfaces on equipment to be grounded, to assure good electrical continuity.
   2. Effectively bond all grounding conductors to grounding electrodes, equipment enclosures and ground buses.
   3. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.
   4. All conduits shall have separate ground wire installed in accordance with Table 250.122 of the National Electrical Code.

B. Service Equipment/Building Ground:
   1. Bond service equipment to incoming main water line with heavy duty ground clamp in accordance with Article 250.50 of National Electrical Code. Size bonding conductor in accordance with Table 250.66 of National Electrical Code unless larger conductor is indicated on the drawings. Utilize insulated bonding conductor.
   2. Building steel shall be connected to ground bus on main service with a conductor the same as specified above.
   3. The system grounds shall be installed and connected as follows: Lay two 500 MCM bare copper conductors in the footing under one wall of the electrical

equipment room. The two conductors shall be continuous in the footing for a minimum of 25 feet. Connect the grounding conductors to ground bus in service entrance section of main switchboard.

4. Grounding electrode conductors specified herein shall be installed without conduit, in general. Where exposed to potential physical damage, install the conductor in Schedule 80 PVC.

C. Feeder/Branch Circuits:
   1. Provide a separate green grounding conductor in the conduit of feeder circuits for the following equipment, sized in accordance with Table 250.122 of the National Electrical Code:
      a. Panelboards
      b. Switchboards
   2. Install a separate green grounding conductor in same conduit as phase and neutral conductor from panel ground bus to device for branch circuits. Install an equal number of grounding and neutral conductors. Size the grounding conductor in accordance with Table 250.122 of the National Electrical Code.
   3. Bond the receptacle ground pin to its box using a bonding jumper, except where isolated ground receptacles are required.
   4. Flexible conduit will not be approved as a grounding means. Flexible conduit shall have a jumper wire sized to ampacity of branch breaker and connected to conduit system on both ends. This applies to fixtures, motors, controls and other devices.

D. Transformers:
   1. Provide a copper bonding jumper to ground the secondary neutral of transformers. Provide a grounding electrode conductor (sized in accordance with National Electrical Code Table 250.66 for the derived phase conductors) to bond the secondary ground of the transformer to the grounding electrode system including the grounding conductor of the primary feeder, the building steel and a cold water main, 1-1/2 inch or larger. Bond across any dielectric unions between point of connection and domestic water entrance.
   2. Main telephone service equipment grounding means shall include but not be limited to a No. 4 AWG, green, insulated, copper grounding conductor connected to the main electrical service equipment ground bus. Terminate this conductor at the telephone equipment location with an ILSCO NB-350-42-R16 grounding bus mounted on the plywood backboard.

3.02 TEST

A. Ground on main service shall be tested using test equipment similar to a "Biddle" tester. Test data shall be submitted to Owner for approval and such approved test data shall become a part of the Operating and Maintenance Instruction Manual. In no event shall ground resistance exceed 25 OHMS. Additional rods or other means shall be employed when measured resistance exceeds 10 OHMS.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide a system of supporting devices and hangers for support or bracing of conduit, electrical equipment, including safety switches, fixtures, panelboards, outlet boxes, junction boxes, and cabinets.

1.02 RELATED WORK

A. Section 26 05 33: Raceways and Conduit Systems

B. Section 26 05 34: Pull and Junction Boxes

C. Section 26 05 35: Outlet Boxes

1.03 SUBMITTALS

A. Submittals are not required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Erico Products, Inc

B. Steel City

C. Minerallac

D. Rayco Fasteners

2.02 TYPES OF SUPPORTING DEVICES

A. Provide appropriate supporting means as detailed on Drawings.

B. Unless otherwise directed in Specifications or Drawings, provide appropriate supporting devices and hangers for electrical equipment from this list of Caddy fasteners:
   1. "Z" purlin clips - 1-1/4" maximum conduit
   2. Conduit clips - 2" maximum conduit
   3. Beam clamps (rod hanger clamps and vertical flange clamps) for support of threaded rods
   4. Beam clamps (set screw type) - 2" maximum conduit

5. Beam clamps (universal) for support of boxes and combination conduit hanger clamps
6. Combination push-in conduit clips - 1" maximum conduit
7. Combination conduit hanger clamps - 2" maximum conduit
8. Flexible conduit clips - 1" maximum flexible conduit
9. Special combination conduit clips - 1" maximum conduit
10. One hole steel straps
11. Conduit hangers - 4" maximum conduit
12. Combination box/conduit hangers for supporting conduit within 3'-0" of a box are not acceptable

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Secure conduits to within 3 feet of each outlet box, junction box, cabinet and fitting and at intervals not to exceed ten feet in accordance with current edition of the National Electrical Code.

B. Install clamps secured to structure for feeder and other conduits routed against the structure. Use drop rods and hangers to support conduits run apart from the structure.

C. Provide and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures and panelboards.

D. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. (Prepainted or galvanized support material is not required to be painted or repainted.)

E. Use of chains, perforated iron, baling wire, or tie wire for supporting conduit runs will not be permitted.

F. Use of Caddy clips to support conduit to top of t-bar ceiling grid will not be permitted.

G. For support of low voltage wiring not required to be in conduit, Contractor shall bundle cables together in a neat manner using approved nylon tie wraps. Bundled cables shall be supported with "J" hooks on telephone type bridle rings, a minimum of six feet on centers.
   1. Use UL listed Ty-wraps for plenum use in plenum areas.
   2. Maximum supported weight rating of "J" hooks shall not be exceeded.
   3. Identify differing types of cables and tag them with tape indicating service, i.e. telephone, nurse call and dictation.
   4. Identification tape shall be provided at minimum intervals of 25 feet on center and within each individual space.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND CONDUIT SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide a complete conduit system with associated couplings, connectors, and fittings.

1.02 RELATED WORK

A. Section 26 05 29: Hangers and Supports for Electrical Systems

1.03 SUBMITTALS

A. Submittal of products furnished under this Section are not required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. EMT, IMC, and Rigid conduit shall be hot dipped, galvanized, or electro galvanized steel by Allied, General Electric, Republic, Triangle, or Wheatland.

B. PVC conduit shall be Carlon, Schedule 40 or Schedule 80, 90 degrees rated.

C. Associated couplings, connectors and fittings shall be steel as manufactured by Raco or equivalent.

D. Erickson couplings shall be used where neither length of conduit can be rotated.

E. EMT box connectors and couplings shall be compression type.

F. Conduit, connectors, couplings and fittings shall be UL listed and labeled.

2.02 ELECTRICAL METALLIC TUBING (EMT)

A. Use Electric Metallic Tubing (EMT) where drawings call for conduit to be:
   1. Concealed in walls
   2. Installed above suspended ceilings
   3. Installed exposed, above 6 feet

2.03 INTERMEDIATE METAL CONDUIT (IMC)

A. Use Intermediate Metal Conduit (IMC) where drawings call for conduit to be:
   1. Installed for feeders
   2. Installed in hazardous areas

3. Installed in concrete slabs on grade to serve floor boxes, freestanding casework, etc
4. Installed exposed below 6 feet
5. Installed in wet locations

2.04 RIGID STEEL CONDUIT (RSC)

A. Use rigid steel conduit where drawings call for conduit to be:
1. Installed underground
2. For feeders
3. Exposed to severe mechanical damage

2.05 POLYVINYL CHLORIDE (PVC)

A. Use PVC for:
1. Underground service entrance conduits for power
2. Underground service entrance conduits for telephone
3. Exterior branch circuits installed underground
4. Concrete encased ductbanks

2.06 FLEXIBLE METAL CONDUIT

A. Provide flexible metal conduit for termination at equipment subject to motion and vibration.

B. Conduit shall be electrically continuous from outlet or conduit end to utilization equipment.

C. Length shall not exceed 6 feet.

D. Maximum length concealed in walls shall be 3 feet.

E. Where exposed to continuous or intermittent moisture, conduit shall be liquid tight.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Minimum size of conduits shall be 3/4"

B. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors and fittings.

C. Make bends or offsets with standard ells or field bends with an approved bender.

D. Run concealed conduits in direct line with long sweep bends or offsets. Run exposed conduits parallel to and at right angles to building lines. Group multiple conduit runs in banks.

E. Conduit systems shall be electrically continuous.

F. Secure conduits to boxes and cabinets with double locknuts and bushings.

G. Cap ends of conduits to prevent entrance of water and other foreign material during construction.

H. Complete conduit systems before pulling conductors.

I. Support conduits as specified in Section 26 05 29 and in accordance with National Electrical Code.

J. Provide cable supports in conduits rising vertically in accordance with the National Electrical Code, Article 300.

K. Provide insulated bushing on both ends of empty conduits.

L. Conduits which pass through floor slabs (except ground floor) shall be sealed with UL listed fire-stopping materials. Seal around conduits or other wiring materials passing through partitions, which extend to the underside of the slab above, and those passing through smoke partitions and fire rated walls. Use U.L. listed materials to prevent passage of smoke or fire. See Division 7 for specific materials required.

M. Conduits which enter crawl spaces, tunnels, and basements from outside the building shall be grouted-in to prevent entry of gases, vapors, insects or rodents to these spaces from street mains.

N. When four or more, 2 inch or larger conduits, are banked together below the ground floor slab they shall be supported and separated using Carlon, Snap-Loc type spacers. Backfill below, between, and above ducts in such a manner to prevent erosion and restore sub-grade preparation prior to concrete slab pour.

O. Where IMC or RSC conduit is installed in a cabinet, junction box, pull box or auxiliary gutter, conductors shall be protected by insulated bushings. Locknuts shall be installed on conduit outside and inside enclosure.

P. Install seal-off fittings in conduits entering hazardous areas and conduits entering cold temperature areas, such as freezers and refrigerators.

Q. Use expansion fittings or flexible conduit, properly bonded, to ensure ground continuity across expansion joints in floors and ceilings.

R. Terminate conduits for feeders and branch circuits directly into panelboard enclosures from which they are served without the use of pull boxes, junction boxes, wire ways, or auxiliary gutters. If the panelboard enclosure does not provide sufficient surface area for all conduits, notify the Engineer and request directions.

S. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit, and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.

T. Conduits shall be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.

U. Where feeder or branch conduits enter pull boxes or junction boxes, clearly mark on conduit on the entering and leaving side of each box the panel name and circuit number(s) contained within the conduit using a permanent black marker.

3.02 PVC

A. Provide 1/4" nylon pull rope in all primary power and incoming telephone service entrance conduits.

B. Use rigid, PVC schedule 80, encased in concrete where called for on drawings, for emergency power circuits and normal power circuits not serving patient care areas.

C. No PVC shall emerge from the ground or the concrete slab or encasement. PVC shall convert to galvanized rigid metal prior to penetrating slab or exiting concrete encasement.

D. Make bends with standard ells or with an approved bender. A blow torch shall not be used.

3.03 FLEXIBLE METAL CONDUIT

A. Conduits shall be 3/8" minimum size for lighting fixtures and 1/2" minimum size for utilization equipment other than lighting fixtures.

B. Fittings shall be made of either steel, or malleable iron only.

C. A copper ground wire shall be installed as a jumper around flexible conduit. The jumper may be installed inside of flexible conduit or outside of conduit to ensure continuity of ground.

D. Recessed lighting fixtures shall be connected with flexible metallic conduit from outlet box to fixture.

E. Install liquid tight flexible conduit in such a manner as to prevent liquids from running on the surface toward fittings.

F. Allow sufficient slack conduit to reduce the effect of vibration.

END OF SECTION

SECTION 26 05 34

PULL AND JUNCTION BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide pull and junction boxes of appropriate size and depth as indicated on the drawings and as specified hereinafter.

1.02 RELATED WORK

A. Section 26 05 29: Hangers and Supports for Electrical Systems.

B. Section 26 05 33: Raceways and Conduit Systems.

C. Section 26 05 53: Identification for Electrical Systems.

1.03 SUBMITTALS

A. Submit product data for each type of box used in exterior work.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. For interior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4" flanges and screw covers.

B. For exterior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4" flanges, bolted covers with full gaskets forming a completely rain tight assembly, equal to Keystone 19000, and 37900 series.

C. For exterior work in graded areas outside the building, provide heavy duty sidewalk junction boxes externally flanged for flush mounting. Covers shall be fully gasketed, watertight and secured with stainless steel screws or bolts equal to Quazite type PC.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Provide junction boxes as shown on drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4" square and 2-1/8" deep.

B. Provide screw covers for junction boxes.

C. Install boxes in conduit runs wherever necessary to avoid excessive runs or bends. Do not exceed 100' runs without pull boxes.

D. Rigidly secure boxes to walls or ceilings. Conduit runs will not be considered as adequate support.

E. Install boxes with covers in accessible locations. Size boxes in accordance with Articles 314 of the National Electrical Code.

F. Do not install pull or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box.

END OF SECTION

SECTION 26 05 35

OUTLET BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide each fixture, switch, receptacle, and other wiring device with a galvanized outlet box of appropriate size and depth for its particular location and use.

1.02 RELATED WORK

A. Section 26 05 29: Hangers and Supports for Electrical Systems.

B. Section 26 05 33: Raceways and Conduit Systems.

C. Section 26 05 53: Identification for Electrical Systems.

1.03 SUBMITTALS

A. Submittal of products furnished under this Section is not required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. National

B. Appleton.

C. Raco.

D. General Electric.

E. Steel City.

2.02 SUPPORTING DEVICES

A. Provide appropriate supporting devices for outlet boxes by Caddy Fasteners or equal as follows:
   1. "RB" box mounting brackets.
   2. Screw gun box brackets.
   3. "H" box mounting brackets.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Locate boxes to prevent moisture from entering or accumulating within them.

B. Support outlet boxes independently of conduit, as required by the National Electrical Code.

C. Provide 4" octagonal x 1-1/2" deep ceiling outlet boxes. For increased cubic capacity, provide 4" octagonal x 2-1/8" , 4" square x 1-1/2" or 4-11/16" square x 2-1/8" ceiling outlet boxes.

D. Provide 4" square X 1-1/2" deep boxes for switch and receptacle outlets in drywall partitions. Use square cut plaster rings installed within 1/4" of finished wall.

E. Provide 4" square x 2-1/2" deep boxes for telephone/data outlets in drywall partitions. Use square cut plastic rings installed within 1/4" of finished wall.

F. Where required to hang a specified fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.

G. Provide 2-1/2" x 3-3/4" one gang masonry boxes for switches and receptacles installed in concrete block walls not plastered. For increased cubic capacity, provide 3-1/2" x 3-3/4" one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4" square boxes with square cut device covers not less than 1" deep specifically designed for this purpose. Use round edge plaster rings only if the block walls are to be plastered. Use sectional or gangable type outlet boxes only in drywall construction.

H. Provide 4-11/16" square X 2" deep outlet boxes with square cut device corners for block walls or round edge plaster rings for plastered walls for telephone outlets, data outlets, and private intercom interphones. Single gang device boxes are not acceptable.

I. Provide fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlets only for ceiling fixture outlets. Provide condulets with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere, damage, or mar the appearance of the installation.

J. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed in compliance with Article 314 of the NEC.

K. Effectively close unused openings in boxes with metal plugs or plates.

L. Set boxes so that front edges of device extensions, plaster rings, etc are flush with finished surfaces.

M. Caddy "H" type box mounting brackets shall not be used on exterior walls, chase walls, or in any other installation where the backside of the stud wall will not be finished. Do not use 4" brackets in thicker stud walls which will not provide adequate bracing.

N. Secure boxes to surfaces upon which they are mounted or embed boxes in concrete masonry. Support boxes from structural members with approved braces.

O. Install blank device plates on outlet boxes left for future use.

P. Provide bushings in holes through which cords or conductors pass.

Q. Install boxes so that the covers will be accessible at all times.

R. Electrical outlet boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings occur on one side only in each framing space, that openings do not exceed sixteen square inches and that boxes on opposite faces of a partition are separated horizontally not less than 24 inches. All clearances between such outlet boxes and the gypsum board shall be completely filled with joint compound or approved fire-resistive compound. The wall shall be built around outlet boxes larger than sixteen square inches so as not to interfere with the wall rating.

S. Install outlet boxes on opposite sides of the same wall offset to avoid back to back mounting where possible.

END OF SECTION

SECTION 26 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with provisions of Sections 26 05 00.

B. Concrete encased underground non-metallic conduit duct bank.

1.02 REFERENCES

A. ANSI C2-97, National Electrical Safety Code.

B. NEMA TC 2-90, Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

C. NEMA TC 3-90, PVC Fittings for Use with Rigid PVC Conduit and Tubing.

D. UL 651_89, UL Standard for Safety - Schedule 40 and 80 Rigid PVC Conduit.

1.03 SUBMITTALS

A. Products furnished from listed manufacturers are pre-approved and require no submittal.

B. Submit proposed substitutions for approval.

C. Submit for information as-built drawings indicating accurate routing of underground duct banks.

1.04 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by UL as suitable for purpose specified and shown.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products. Protect on-site storage from weather.

B. Accept conduit on-site. Inspect for damage.

C. Protect nonmetallic conduit from entrance of debris, and provide appropriate covering to protect from sunlight.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carlon

B. Allied Tube and Conduit

2.02 RIGID NON-METALLIC CONDUIT

A. Rigid PVC Conduit: NEMA TC 2; UL 651 listed; Schedule 40.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.03 CAST-IN-PLACE CONCRETE

A. Concrete: Refer to Division 03.

B. Concrete shall have minimum 28-day strength of 3,000 psi.

C. Reinforcement: Duct banks under concrete or pavement and subject to traffic shall be reinforced. The reinforcement shall extend a minimum of 10 feet from edge of concrete or pavement.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify routing and termination locations of conduit duct bank prior to excavation.

B. Verify field measurements.

C. Verify conduit is anchored prior to placing concrete.

3.02 PREPARATION

A. Excavate, trench, and prepare site for underground conduit duct bank installation.

3.03 INSTALLATION

A. Where necessary to cut conduit, use saw or pipe cutter; ream cut ends. Bring conduit to shoulder of fittings; fasten securely.

B. Join nonmetallic conduit using cement recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

C. Use suitable separators and chairs installed not greater than 4 ft on centers. Band conduit together with suitable banding devices. Anchor conduit to prevent movement during concrete placement.

D. Stagger conduit joints in concrete encasement 6 in. min, vertically.

E. Install conduit with minimum grade of 3-inches/100 ft. (Only required where conduit terminates at a manhole.)

F. Depth: Per ANSI C2; top of duct bank 18 in. minimum, 30 inches maximum below finished grade unless approved by the Engineer.

G. Terminate conduits with Termi-Duct type end bells at manhole entries.

H. Use suitable caps to protect installed conduit from entrance of dirt and moisture.

I. Duct banks installed under grass and other non-traffic areas do not require any additional reinforcement steel. Duct banks installed below load bearing building concrete slabs may need to be reinforced and must be coordinated with the general contractor.

J. Duct banks installed under concrete or pavement subject to vehicular traffic shall be reinforced in the following manner.
   1. Place #4 steel rebar in the top and both sides of the duct bank in the horizontal plane and lengthwise direction. There shall be one rebar in each corner with a maximum distance of 8 inches between rebars.
   2. Place a "U" shaped stirrup fabricated from #4 rebar in the vertical plane every 3 feet in the lengthwise direction.
   3. Rebar shall be tied together in an acceptable manner using standard steel tie wire.
   4. All rebar shall have a minimum concrete cover of 2 inches.

K. Pour concrete into formed bank of conduits. Provide a minimum of 3 inches of concrete cover at bottom, top, and sides of conduit duct bank. Vibrate concrete with a mechanical vibrator to ensure proper concrete fill and elimination of voids.

L. Uniformly dust red iron oxide over top of freshly poured concrete at the rate of 1 lb/yd of surface.

M. Duct banks shall be backfilled in the following manner.
   1. Duct banks installed under grass and other non-traffic areas shall be backfilled with clean suitable earth. The earth shall be compacted sufficiently to prevent any settlement.
   2. Duct banks installed under concrete or pavement subject to vehicular traffic shall be backfilled with #57 (3/4") washed limestone gravel. The gravel shall be compacted sufficiently to prevent any settlement. Coordinate with general contractor to ensure suitability for the concrete or pavement cover.

END OF SECTION

SECTION 26 05 44

PREFABRICATED CONCRETE MANHOLE

PART 1 GENERAL

1.01 WORK INCLUDED

A. This specification prescribes the minimum design and installation criteria to be applied when designing, manufacturing, and installing sectional pre-cast concrete electrical manholes.

B. The manhole shall be supplied in two sections. The size shall be 10'x 10' x 7' unless noted otherwise on the drawings. (Inside dimensions) The minimum wall thickness shall be 6 inches.

C. Comply with section 26 05 00.

D. Provide, install, and place in service all electrical manholes as indicated on the drawings and contract documents.

1.02 RELATED WORK

A. Section 26 05 43: Underground Ducts and Raceways for Electrical Systems

B. Section 26 05 13: Medium Voltage Cable

C. Section 26 05 19: Low Voltage Electrical Power Conductors

1.03 SUBMITTALS

A. Product data sheets on each type of manhole.

B. Drawings for each type and size manhole. Minimum size drawing shall be "C" (11" x 17").

1.04 QUALITY ASSURANCE

A. Each manhole manufacturer shall provide adequate documentation of a Quality Assurance program that will provide reasonable assurance that the manholes will be manufactured in accordance with this specification and all applicable industry standards and specifications.

1.05 CODES AND STANDARDS

A. American Concrete Institute.
   1. ACI-318 Building Code Requirements for Reinforced Concrete.

B. American Society for Testing Materials (ASTM)
   1. A615 -Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   2. A706 -Low-Alloy Steel Deformed Bars for Concrete Reinforcements.

3. C31 --Making and Curing Concrete Test Specimens in the Field.
4. C33 --Concrete Aggregates.
5. C39 --Compressive Strength of Cylindrical Concrete Specimens.
6. C94 --Ready Mixed Concrete.
7. C143 -Slump of Portland Cement Concrete.
8. C150 -Portland Cement.
9. C260 -Air-Entraining Admixture for Concrete.
10. C494 -Chemical Admixtures for Concrete.
11. C857 -Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
12. C858 -Underground Precast Concrete Utility Structures.
13. C891 -Installation of Underground Utility Structures.

C. American Welding Society (AWS).
1. D1-4, Structural Welding Code (reinforcing steel).
2. D-12, Recommended Practices for Welding Reinforcing Steel.
3. The manhole installation shall comply with the latest issue of the National Electrical Code, the National Electrical Safety Code, and all applicable local and state requirements.

PART 2 PRODUCTS

2.01 DESIGN LOADS

A. Design loads shall consist of dead loads live loads, and impact loads, Dead loads include hydrostatic pressure due to the water table assumed to be at three (3) feet. Live loads are designed for H-20 and/or H-20-44 traffic loads (16,000lb. wheel load). The dead load is considered to be the worst condition with the water table located at 3'-0" below the surface.

B. Precast concrete electrical manholes are to be designed in accordance with the American Association of State Highway and Transportation Officials (MSHTO), the American Society for Testing Materials (ASTM C-857), and the American Concrete Institute (ACI 318), as last revised. The electrical manholes are to be fabricated in accordance with ASTM C-658, customer drawings, and specifications.

2.02 FORMS

A. All forms used for the placement of concrete are of metal and structurally designed and constructed to maintain their alignment under the extreme pressure of the concrete during placement.

2.03 MATERIALS

A. Concrete
1. Portland cement shall conform to ASTM C150, "Specifications for Portland Cement" as last revised and shall be type II, low alkali Portland cement.
2. Fine Aggregates shall conform to the requirements of ASTM C-33 "Specifications for Concrete Aggregates". These fine aggregates shall be properly graded and free of any deleterious materials to produce a homogenous concrete matrix when mixed with cement.

3. Coarse Aggregates shall conform to the requirements of ASTM C-33, "Specifications for Concrete Aggregates". The maximum size of aggregate shall conform to those requirements specified in the mix design. These aggregates shall be properly graded and free of any deleterious materials to produce a homogenous concrete matrix when mixed with cement.
4. Lightweight aggregates shall conform to the requirements of ASTM C-330, Specification for Structural Concrete".
5. Water used in mixing concrete shall be potable, free from deleterious amounts of oils, acid, alkalis, salts, organic materials, or other substances which may adversely affect the properties of the concrete Non-potable water may be used as mixing water provided that the mortar cubes made with non-potable water have a seven day strength (equal to no less than 90% the strength) of mortar cubes made with potable water.

2.04 ADMIXTURES SHALL CONFORM TO THE APPLICABLE SPECIFICATIONS AS FOLLOWS

A. ASTM C-260 - Chemical Admixtures for Concrete

B. ASTM C-494 - Fly ash and raw or calcined natural Pozzolan for use as a mineral admixture in Portland Cement Mix

C. ASTM C-618 - Pigments for integrally colored Concrete

2.05 REINFORCEMENT

A. All reinforcement steel, including welded wire mesh, shall be of the size and in the location as shown on the plans. All reinforcing shall be sufficiently tied to withstand any displacement during the pouring operation. All bars shall be intermediate grade, or as specified, billet steel conforming to ASTM A-615 or A-706 as required.

B. Steel reinforcing bars shall conform to those requirements set forth in the following specifications:
1. Specification for Deformed and Plain Billet Steel for Concrete Reinforcement" including supplemental requirements, ASTM A615 (Including SI).
2. Low Alloy Steel Deformed Bars for Concrete Reinforcement", A-706.
3. "Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement", ASTM A-185.

2.06 COMPRESSIVE STRENGTH

A. Sufficient cement content shall be used as to produce a minimum compressive strength of 4500 PSI at 28 days.

2.07 BATCHING

A. A central batching facility shall be used to assure accurate weighing and mixing of materials to obtain a suitable concrete mix.

2.08 PLACING

A. Concrete shall be made by properly proportioned parts of sand, aggregate, and cement with sufficient water to produce concrete mix of uniform quality and slump. Handling from the mixer or the transport vehicle to the forms for deposit will be in a continuous manner, as rapidly as practicable without segregation or loss of ingredients, until the unit or segment pouring is completed. Compaction by either external or internal mechanical vibration shall be used during the placement of the concrete mix.

2.09 CURING

A. Concrete while still in the forms may be steam cured after an initial set has taken place. Steam temperature shall not exceed 160 degrees Fahrenheit, and shall not be increased from ambient temperature at a rate exceeding 40 degrees Fahrenheit per hour. Steam curing shall be considered complete after sufficient time has elapsed to produce adequate strength to withstand any structural strain that may be subjected during the form stripping operation.

B. Additional curing may be applied by means of water spraying or membrane curing compound to reach the ultimate strength requirements.

2.10 WATER PROOFING

A. Butyl Rubber, SS-S-00210 shall be used as a joint sealant at all construction joints.

2.11 MANHOLE COVER

A. Cover shall be cast iron, USF 640, 770 pounds. The diameter shall be 40". It shall be inscribed with "ELECTRICAL".

B. The covers shall be fastened by a minimum of two penta-head type bolts 1/2 inch in diameter to prevent unauthorized removal.

2.12 CONDUIT FITTINGS

A. Term-A-Duct conduit inserts shall be installed per the drawings. They shall be sized for 5" Schedule 40 PVC conduit unless noted otherwise on the drawings. Unless otherwise noted on the drawings, the center-to-center distance shall be 7.5 inches. The minimum distance from edge of duct to a wall or construction joint shall be 6 Inches. Unless otherwise noted on the drawings, the duct group shown shall be installed in the center of each wall of each section of the manhole. There shall be at least two spare inserts in each side whether shown or not.

2.13 ANCHORS

A. 1/2" inserts shall be installed as required to facilitate installation of cable support racks. Inserts shall be installed a minimum of 18" centers horizontally and 12" centers vertically.

2.14 SUPPORTS

A. Metal support racks shall be installed every 18" horizontally and 12" vertically to properly support the cable. Supporting arm width and number of levels shall be determined by number of circuits.

2.15 PULLING IRONS

A. Imbedded pulling iron shall be installed in the floor of the manhole on all four sides.

2.16 GROUNDING

A. Each manhole shall have an opening in the bottom corner for a 3/4-inch ground rod. In addition, at each duct bank entrance, there shall be an opening for a 4/0 AWG bare copper wire.

B. A 4/0 bare copper wire shall be installed completely around the inside walls to provide for grounding of cable splices, support racks, etc. The wire shall be connected to the 4/0 bare wire in each duct bank and to the ground rod.

2.17 MANUFACTURER

A. Oldcastle Precast is the approved manufacturer. Products equal in all aspects from other manufacturers will be considered if they are submitted for approval no less than 10 days before bid date.

B. Vendor drawings will be submitted for approval before manufacturing is begun.

PART 3 EXECUTION

3.01 MANHOLES SHALL BE INSTALLED IN THE FOLLOWING MANNER

A. The manhole shall be installed so that the top of the concrete cover is 6 inches below the ground elevation. This will allow the top of the steel manhole cover to be 4 inches above the ground elevation. Note that the ground should be rounded up to be flush at the manhole cover location and sloped away in a minimum 20-foot circle to provide proper drainage away from manhole cover.

B. If the manhole is installed in a street or other paved or concrete area, the manhole cover must be flush with the finished pavement or concrete.

C. The hole shall be excavated to a depth at least 6 inches deeper than required for the proper elevation of the manhole and this excess depth filled with 1/2-inch gravel and compacted to a density sufficient to support the manhole without any settling. A pneumatic compactor shall be used.

D. The earth shall be back-filled around the manhole and compacted before trenching for the duct banks begins.

E. Raceway numbers shall be stenciled above each conduit entrance with minimum 3-inch high letters.

F. The ground rod and grounding cable openings shall be sealed after all devices are installed.

G. Ballast weight shall be added to manhole where required to prevent floating due to water pressure.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Requirements for identification of electrical equipment, circuit identification, system color coding and warning signs.

1.02 RELATED WORK

A. Section 26 05 00: Common Work Results for Electrical

1.03 SUBMITTALS

A. Submittal of product furnished under this section is not required.

PART 2 PRODUCTS

2.01 IDENTIFICATION OF EQUIPMENT

A. Identify electrical equipment with permanently attached phenolic plates with 1/4" white or black engraved lettering on the face of each, attached with two sheet metal screws. Provide nameplate colors as specified in other parts of this section.

B. Include the following information on panelboard identification plates:
   1. Panel Name
   2. Name of panel serving it
   3. Voltage and Phase

2.02 CIRCUIT IDENTIFICATION

A. Identify feeder j-boxes and pull boxes with designation of panelboard/switchboard source as "FROM" and load served as "TO" with permanent labels.

B. Identify pull and junction boxes with the designation of panelboard and the circuit number of each circuit contained therein, with permanent marker. Clearly mark information on or in the box, not on the cover, so that the information is easily identifiable.

C. Identify circuits in conduits entering outlet boxes with the designation of panelboard and the circuit number of each circuit contained therein, with permanent marker.

2.03 COLOR CODE IDENTIFICATION

A. Color code phenolic plates utilized to identify electrical equipment according to which branch of the electrical system the equipment is connected to as follows:
   1. Normal - Black with white letters.
   2. Fire Alarm - Red with white letters.

B. If existing equipment identification nameplates are a different color, request a ruling from the design professional to determine what color scheme to follow.
   1. Fire Alarm System - Red

2.04 WARNING SIGNS

A. Provide warning signs called for by NFPA 70, by OSHA and by the list included below.

B. Use Seton Name Plate Company products, 10" x 7" size, pressure-sensitive (PSPL) for indoor use, 30 ga. baked enamel for outdoor use (30 BE) with style numbers shown below.

C. Danger - Electrical Hazard - Authorized Personnel Only, Style No. 161.
   1. Main electrical room(s),
   2. Electrical equipment closet(s).

PART 3 EXECUTION

3.01 INSTALLATION

A. Identify the following electrical equipment as called for herein:
   1. Switchboards, switchgear, and individual devices installed in them.
   2. Panelboards.
   3. Safety switches and disconnects.
   4. Contactors and motor starters.
   5. Cabinets:
      a. Fire Alarm Cabinets
      b. Lighting Control Cabinets
   6. Individually mounted circuit breakers.
   7. Relays.
   8. Shunt trip pushbuttons:
      a. Main Service Disconnects.
      b. Computer Power
      c. Computer HVAC power.
   9. Transformers. Starters and relays connected under this Division shall be identified whether furnished under this Division or under other Divisions.

END OF SECTION

SECTION 26 05 73

POWER SYSTEM ANALYSIS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Short-circuit and protective device coordination studies as prepared by the electrical equipment manufacturer or a professional electrical engineering firm.

B. Arc Flash Hazard Analysis Study per the requirements set forth in NFPA 70E - Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according IEEE 1584.

C. The studies shall include all new electrical distribution equipment supplied under this contract.
   1. Include all directly affected existing distribution equipment including emergency equipment at the customer facility.
   2. Include all existing distribution equipment including emergency equipment at the customer facility.

1.02 RELATED SECTIONS

A. Section 26 05 00: Common Work for Electrical

B. Section 26 24 13: Switchboards

C. Section 26 24 16: Panelboards

1.03 REFERENCES

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
   1. IEEE 141 - Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
   2. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
   3. IEEE 399 - Recommended Practice for Industrial and Commercial Power System Analysis
   4. IEEE 241 - Recommended Practice for Electric Power Systems in Commercial Buildings
   5. IEEE 1015 - Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems
   6. IEEE 1584 - Guide for Performing Arc-Flash Hazard Calculations

B. American National Standards Institute (ANSI):
   1. ANSI C57.12.00 - Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
   2. ANSI C37.13 - Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures

3. ANSI C37.010 - Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
4. ANSI C 37.41 - Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories

C. The National Fire Protection Association (NFPA)
1. NFPA 70 - National Electrical Code
2. NFPA 70E - Standard for Electrical Safety in the Workplace

1.04 SUBMITTALS FOR REVIEW/APPROVAL

A. Submit a preliminary short-circuit and protective device coordination study to the design engineer prior to receiving final approval of the shop drawings and/or prior to release of equipment drawings for manufacturing. The preliminary study shall provide sufficient data to ensure that the selection of equipment will have adequate ratings and the protective device trip characteristics will be satisfactory.

B. Submit the final short-circuit and protective device coordination analysis at the end of the construction cycle when circuits are installed and all equipment is on site and/or installed such that complete and accurate data may be obtained.

C. Submit the arc flash hazard analysis at the end of the construction cycle when circuits are installed and all equipment is on site and/or installed such that complete and accurate data may be obtained.

1.05 SUBMITTALS FOR CONSTRUCTION

A. The results of the final short-circuit, protective device coordination, and arc flash hazard (if required) analysis studies shall be summarized in a final report. No more than five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short-circuit input and output data. Additional copies of the short-circuit input and output data, where required, shall be provided on CD in PDF format.

B. At the owner's option, the contractor is required to provide the study project files to the Owner in electronic format including all project files, libraries, etc to allow the owner to update and to print additional copies, labels, etc.

C. If the owner does not use the applicable computer program, a copy of the computer analysis software viewer program is required to accompany the electronic project files, to allow the Owner to review all aspects of the project and print arc flash labels, one line diagrams, etc.

D. The report shall include the following sections:
1. Executive Summary.
2. Descriptions, purpose, basis and scope of the study.
3. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short circuit duties.

4. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip unit settings, and fuse selection.
5. Fault current calculations including a definition of terms and guide for interpretation of the computer printout.
6. Details of the incident energy and flash protection boundary calculations.
7. Recommendations for system improvements, where needed.
8. One line diagram.
9. Equipment specific arc flash labels.

E. If the power systems study submittal is not approved following the second submittal, the contractor shall pay the Project Engineer $200.00 per hour to review additional submittals until the study is approved.

1.06 QUALIFICATIONS

A. The short-circuit, protective device coordination and arc flash hazard analysis studies (if required) shall be conducted under the supervision and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.

B. The Registered Professional Electrical Engineer shall be a full-time employee of the electrical equipment manufacturer or a professional electrical engineering firm.

C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

D. The equipment manufacturer or approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting a detailed plan outlining the steps to be taken to ensure a proper outcome (if required).

1.07 COMPUTER ANALYSIS SOFTWARE

A. The studies shall be performed using the latest revision of the SKM Systems Analysis Power*Tools for Windows (PTW) software program. Other commercially available products may be considered under certain circumstances.

PART 2 PRODUCT

2.01 STUDIES

A. Furnish short-circuit and protective device coordination studies as prepared by the electrical equipment manufacturer or a professional electrical engineering firm.

B. Furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace.

2.02 DATA COLLECTION

A. Contractor shall furnish all data as required by the power system studies. The Engineer performing the short-circuit, protective device coordination, and arc flash hazard analysis studies (if required) shall furnish the Contractor with a list of required data immediately

after award of the contract. The Contractor shall expedite collection of the data to ensure completion of the studies as required.

B. The engineer performing the study shall make at least one job site visit before completion of the final study to familiarize himself/herself with the project to ensure that the provided data is accurate.

C. Source contribution shall include present and future motors and generators.

D. Load data utilized shall include existing and proposed loads obtained from Contract Documents provided by Owner, or Contractor.

E. If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.03 SHORT-CIRCUIT STUDY

A. Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standard 141.

B. Estimated conductor lengths, typical generator, transformer, motor, and utility data may be used for the preliminary study.

C. Actual installed conductor lengths, test and/or nameplate data for all generators, transformers, motors 50 HP and larger, capacitors, reactors, or other equipment that may affect the study must be used for the final study.

D. Actual utility fault current and X/R ratio shall be used Infinite bus calculation is not acceptable.

E. The pre-fault bus voltage shall be the highest reported by the utility for past 5 years. If unavailable, 1.05 per unit shall be used.

F. Provide the following:
   1. Calculation methods and assumptions.
   2. Selected base per unit quantities.
   3. One line diagram of the system being evaluated.
   4. Utility impedance data, including the maximum and minimum 3 phase and line-to-ground fault current available, nominal, maximum, and minimum voltage, 3 phase X/R ratio line-to-ground X/R ratio.
   5. Utility protective device settings including recloser if used.
   6. Motor fault contribution characteristics.
   7. Generator fault contribution characteristics.
   8. Tabulations of calculated quantities.
   9. Results, conclusions, and recommendations.

G. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:
   1. Electric utility's supply termination point
   2. Incoming switchgear
   3. Unit substation primary and secondary terminals

4. Low voltage switchgear.
5. Motor control centers.
6. Standby generators and automatic transfer switches.
7. Branch circuit panelboards.
8. Other significant locations throughout the system.

H. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.

I. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to short circuit ratings.
2. Adequacy of switchgear, switchboards, disconnects, transfer switches, motor control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Notify Owner, in writing, of any existing circuit protective devices improperly rated for the calculated available fault current.

2.04 PROTECTIVE DEVICE COORDINATION STUDY

A. Proposed protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs. No more than 5 devices shall be shown on any plot.

B. Include on each TCC graph, a complete title, applicable notes, and one-line diagram with legend identifying the specific portion of the system covered.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the TCC graphs, where applicable:
1. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
2. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
3. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves. The frequent fault portion of the damage curve should not be shown unless the transformer feeds overhead lines. The shifted curve for line-to-ground faults on the secondary side shall be shown on the ground fault plot.
4. Conductor damage curves.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

2.05 REPORT SECTIONS

A. Input data shall include, but not be limited to the following:
1. Feeder input data including feeder type (cable or bus), size, length, number per phase, conduit type (magnetic or non-magnetic) and conductor material (copper or aluminum).

2. Transformer input data, including winding connections, secondary neutral-ground connection, primary and secondary voltage ratings, KVA rating, impedance, % taps and phase shift.
3. Reactor data, including voltage rating, and impedance.
4. Generation contribution data, (synchronous generators and Utility), including short-circuit reactance (X"d), rated MVA, rated voltage, three-phase and single line-ground contribution (for Utility sources) and X/R ratio.
5. Motor contribution data (induction motors and synchronous motors), including short circuit reactance, rated horsepower or KVA, rated voltage, and X/R ratio.

B. Short-Circuit Output Data shall include, but not be limited to the following reports:
1. Low Voltage Fault Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
   a. Voltage
   b. Calculated fault current magnitude and angle
   c. Fault point X/R ratio
   d. Equivalent impedance
2. Momentary Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
   a. Voltage
   b. Calculated symmetrical fault current magnitude and angle
   c. Fault point X/R ratio
   d. Calculated asymmetrical fault currents
3. Based on fault point X/R ratio
4. Based on calculated symmetrical value multiplied by 1.6
5. Based on calculated symmetrical value multiplied by 2.7
   a. Equivalent impedance
6. Interrupting Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
   a. Voltage
   b. Calculated symmetrical fault current magnitude and angle
   c. Fault point X/R ratio
   d. No AC Decrement (NACD) Ratio
   e. Equivalent impedance
   f. Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a symmetrical basis
   g. Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a total basis

C. Recommended Protective Device Settings:
1. Phase and Ground Relays:
   a. Current transformer ratio
   b. Current setting
   c. Time setting
   d. Instantaneous setting
   e. Recommendations on improved relaying systems, if applicable.
2. Circuit Breakers:
   a. Adjustable pickups and time delays (long time, short time, ground)

b. Adjustable time-current characteristic
c. Adjustable instantaneous pickup
d. Recommendations on improved trip systems, if applicable.

PART 3 EXECUTION

3.01 FIELD ADJUSTMENT

A. Adjust relay and protective device settings according to the recommended settings table provided by the coordination study. Field adjustments to be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to provide for conformance with short circuit and protective device coordination studies.

C. Notify Owner in writing of any required major equipment modifications.

3.02 ARC FLASH WARNING LABELS

A. The label shall include the following information, at a minimum:
1. Location designation
2. Nominal voltage
3. Hazard risk category
4. Incident energy
5. Working distance
6. Engineering report number, revision number and issue date.

B. Labels shall be machine printed, with no field markings.

C. Labels shall be field installed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

END OF SECTION

SECTION 26 22 13

LOW VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide dry type transformers as shown on drawings.

1.02 RELATED SECTIONS

A. Section 26 05 26: Grounding and Bonding for Electrical Systems

B. Section 26 05 53: Identification for Electrical Systems.

1.03 REFERENCES

A. ANSI/IEEE C57.96 - Distribution and Power Transformers, Guide for Loading Dry-Type (appendix to ANSI C57.12 standards)

B. ANSI/IEEE C89.2 - Dry Type Transformers for General Applications

C. ANSI/NFPA 70 - National Electrical Code

D. IEEE C57.12.01 - General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid Cast and / or Resin-Encapsulated Windings

E. IEEE C57.12.91 - Test Code for Dry-Type Distribution and Power Transformers

F. NEMA ST 20 - Dry Type Transformers for General Applications

G. UL 506 - Specialty Transformers

1.04 SUBMITTALS

A. Submit products for review.

B. Submit dimensioned equipment location layouts in accordance with section 26 05 00.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D

B. Eaton/Cutler-Hammer

C. General Electric

D. Siemens

2.02 EQUIPMENT REQUIREMENTS

A. Provide general purpose, self cooled dry type transformers designed for 60 Hz operation as shown on drawings. Transformers to be designed, manufactured and tested in accordance with the latest ANSI, NEMA and IEEE Standards. Transformers to be listed and labeled in accordance with UL 1561.

B. Transformers to be compliant with NEMA TP-1 energy efficiency requirements per EPAct 2005/CFR 10 Part 431.

2.03 INSULATION SYSTEM

A. Provide ventilated type transformers for 15 KVA and larger with a UL recognized 220 degree insulation system. Base the KVA ratings on an allowable 80, 115 or 150 degree C winding temperature rise above a 30 degree hot spot.

B. Transformer design KVA Rating shall be suitable for a 30 degree C average and 40 degree C maximum ambient temperature.

2.04 CORE AND COIL

A. Core construction to be of non-aging electrical grade grain-oriented silicon steel to minimize hysteresis and eddy current losses. Core lamination shall be tightly assembled.

B. Provide windings wound of high quality copper or aluminum.

C. Arrange ventilated windings to brace coil layers and provide maximum ventilation. Construct core and coil assemblies to provide short circuit withstand capability as defined by ANSI and NEMA standards. Securely bolt complete assembly to the enclosure base using vibration dampening pads to reduce noise.

D. The complete core and coil shall be impregnated with non-hydroscopic, thermo-setting polyester varnish to provide a high dielectric and flame retardant seal. The shield of varnish to the coils shall effectively impregnate the entire core and coil assembly that results in a unit which is virtually impermeable to moisture, dust, salt air and other contaminants. Cast encapsulated core and windings in a resin compound to provide a moisture-proof, shock-resistant, high dielectric seal.

E. Provide full capacity taps in the high-voltage windings of transformers. For 3 phase transformers rated below 15 KVA, provide two 5% full capacity below normal taps . For 3 phase transformers rated 15 KVA and above, provide two 2.5% full capacity above normal taps and four 2.5% full capacity below normal taps

2.05 ENCLOSURES

A. Provide NEMA 1 ventilated enclosures of heavy gauge steel construction for indoor transformers. Provide weather shields for ventilated transformers installed outdoors

conforming to the requirements of NEMA 250, Type 3R. Finish enclosures in ANSI 61 gray paint.

B. Unless otherwise specified, sound levels shall be in accordance with values allowed by NEMA ST-20.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Provide flexible conduit to and from transformer.

B. Install transformers in accordance with manufacturer's recommendations.

C. Provide vibration isolation devices whether floor mounted or hung from structure as follows:
   1. Install floor mounted transformers on two (2) layer, one (1) inch thick, rubber neoprene pads with galvanized shims (Mason Super "W" or equal).
   2. For suspended transformers provide spring hangers (Mason 30N or equal) with double neoprene elements at the top of the device with spring seated neoprene cups at the base of the device for sway bracing purposes.

D. Provide working clearances around transformers in accordance with Article 110 of the National Electrical Code.

E. Provide separation and clearance around transformers in accordance with manufacturer's recommendation to allow adequate cooling.

F. Ground transformers in accordance with Articles 250 and 450 of the National Electrical Code.

G. Mount floor mounted transformers on one inch (1") thick rubber pad.

END OF SECTION

SECTION 26 24 13

SWITCHBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and install a complete system of Low Voltage, Type 1 and/or Type 2 switchboards with circuit breakers and/or fusible switches for mains, ties. and feeders as specified below and as indicated on the drawings.

B. The requirements of the Contract, Division 01 and Division 26, apply to work in this section.

1.02 RELATED SECTIONS

A. Section 26 05 00: Common Work Results for Electrical

B. Section 26 43 13: Transient Voltage Surge Suppression

1.03 REFERENCES

A. The low voltage switchboards and protection devices in this specification are designed and manufactured according to latest revision of the following applicable standards.
   1. ANSI C37.16, Low Voltage Power Circuit Breakers and AC Power Circuit Protectors, Preferred Ratings, Related Requirements and Application Recommendations for
   2. ANSI/IEEE C37.13. Low-voltage AC power circuit breakers used in enclosures.
   3. ANSI/NEMA PB 2, Deadfront Distribution Switchboards
   4. ANSI/NEMA PB 2.1, General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less
   5. ANSI/NFPA 70, National Electrical Code
   6. NEMA AB 1, Molded Case Circuit Breakers and Molded Case Switches
   7. NEMA KS 1, Fused and Non - Fused Switches
   8. UL 489, Molded Case Circuit Breakers and Circuit Breaker Enclosures
   9. UL 891, Dead Front Switchboards
   10. UL 98, Enclosed and Dead Front Switches
   11. UL 1066, Low Voltage AC and DC Circuit Breakers Used in Enclosures
   12. UL 977, Fused Power Circuit Devices

1.04 DEFINITIONS

A. Insulated Case Circuit Breaker: Molded case circuit breaker built and listed to UL489 requirements. Insulated case circuit breakers are distinguished from normal molded case circuit breakers by the stored energy mechanism employed to open and close and the inclusion of internal motor operators when electrical operation is required.

B. Low Voltage Power Circuit Breaker: Also typically referred to as "air circuit breaker", "metal frame circuit breaker," or "ANSI circuit breaker". Differentiated from molded case and insulated case circuit breakers by many characteristics defined in the applicable UL and ANSI standards, including but not exclusively, significant 30 cycle withstand ratings, single pole ratings, and ease of maintenance.

C. Bolted Pressure Switch: Also referred to as high pressure contact switches. A type of switch with a spring loaded mechanism to close or open the circuit and a method of applying high pressure to the contacts to ensure high ampacity similar to a bolted bus joint.

D. Front-Accessible Only: Shall be as defined by UL 891 standard which requires that all line and load connections for phase, neutral, and ground conductors be accessible front the front of the switchboard allowing it to be mounted against a wall.

1.05 SYSTEM DESCRIPTION

A. The power system feeding the switchboard shall be 277/480 volt, solidly grounded wye unless noted otherwise on the drawings.

B. Switchboard(s) shall have front access and rear alignment for mounting against a wall or rear access as indicated on the drawings.

1.06 SUBMITTALS

A. Manufacturer shall provide minimum of 8 copies of the following documents, where applicable, to owner for review and evaluation in accordance with general requirements of Division 01 and Division 26:
   1. Front view and floor plan of switchboard
   2. Switchboard anchoring locations
   3. Conduit and busway entry / exit locations
   4. One-line diagram of switchboard bus and protective devices
   5. Switchboard ratings including:
      a. Short circuit rating
      b. System voltage rating
      c. Continuous current rating
   6. Protective device schedule including:
      a. Device type
      b. Sensor and trip rating
      c. Location within the switchboard
      d. Cable quantity and size capabilities for each device
   7. Panel drawing showing all major protection, instrumentation, and control devices mounted within the switchboard
   8. Schematic diagram showing power, metering, and control circuits for the switchboard and circuit breakers
   9. Bill of Material listing (including quantity, location, catalog number, and ratings) of all major protection, instrumentation and control devices
   10. Switchboard nameplate schedule

1.07 PROJECT RECORD DOCUMENTS

A. Manufacturer shall submit minimum 8 copies:
   1. Include as built record drawings as follows:
      a. Front View
      b. Floor Plan
      c. Elementary Diagram showing power, metering and control circuits
      d. Switchgear internal wiring diagrams
      e. Bill of Material
      f. One Line Diagram
      g. Three Line Diagram
   2. Instruction books on major components
   3. Installation drawings
   4. Certified test reports
   5. Recommended renewal parts information

1.08 INSTALLATION, OPERATION AND MAINTENANCE DATA

A. Manufacturer shall provide minimum 8 copies of installation, operation, and maintenance procedures to owner in accordance with general requirements of Division 01 and Division 26.

B. Submit operation and maintenance data based on factory and field testing, operation and maintenance of specified product.

1.09 QUALITY ASSURANCE QUALIFICATIONS

A. Manufacturer shall have specialized in the manufacture and assembly of low voltage switchboards for 25 years.

B. Manufacturer shall have available for review, if requested by the engineer, a certificate of ISO 9002 Compliance.

1.10 REGULATORY REQUIREMENTS

A. Low voltage switchboards shall be listed and/or classified by Underwriters Laboratories in accordance with standards listed in paragraph 1.03 of this specification and shall bear UL labels in accordance with those standards.

B. Switchboards shall be qualified for use in seismic loading UBC zone that is appropriate for the site location as defined in IEEE 693.

C. Where used as service entrance equipment, it shall be listed as a service entrance switchboard.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall store, protect, and handle products in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals.

B. Ship each switchboard section in individual shipping splits for ease of handling. Each section shall be mounted on shipping skids and wrapped for protection.

C. Contractor shall inspect and report concealed damage to carrier within 48 hours.

D. Contractor shall store in a clean, dry space. Cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Provide heat in the enclosures to prevent condensation.

E. Contractor shall handle in accordance with manufacturer's recommendations to avoid damaging equipment, installed devices, and finish.

1.12 PROJECT CONDITIONS (SITE ENVIRONMENTAL CONDITIONS)

A. Follow applicable NEMA, ANSI, and NECA standard practices before, during, and after switchboard installation.

B. Indoor switchboards shall be located in well-ventilated areas, free from excess humidity, dust, and dirt and away from hazardous materials. Ambient temperature of area will be between 0 and plus 40 degrees C.

C. Outdoor switchboards shall be located in well-ventilated areas, and away from hazardous materials. Ambient temperature of area will be between minus 30 and plus 40 degrees C.

1.13 SEQUENCING AND SCHEDULING

A. Provide a written detailed description of scheduled installation, testing, and startup dates.

1.14 WARRANTY

A. Manufacturer warrants equipment to be free from defects in materials and workmanship for 1 year from date of acceptance by the owner or 18 months from date of delivery, whichever occurs first.

1.15 FIELD MEASUREMENTS

A. Contractor shall make all necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in National Electrical Code.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approved manufacturers are:
   1. General Electric
   2. Eaton/Cutler Hammer
   3. Siemens Energy Automation
   4. Square D

B. Other manufacturers' products of equivalent quality, dimensions and operating features may be acceptable, at the Engineer's discretion, if they comply with all requirements specified or indicated in these Contract documents. Request for approval shall be submitted 10 business days before bid date. Substitutions will not be considered after this date.

2.02 EQUIPMENT

A. Furnish Low Voltage Switchboards with molded case, insulated case, steel frame power circuit breakers, fusible switches, and/or bolted pressure switches as indicated on drawings and in this specification.

B. Provide unit substation transformers where indicated on the drawings and as specified in transformer specifications.

2.03 COMPONENTS

A. Refer to Contract Drawings for actual layout and location of equipment and components; current ratings of devices, bus bars, and components; voltage ratings of devices, components and assemblies; interrupting and withstand ratings of devices, buses, and components; and other required details.

B. General
   1. The low voltage switchboards shall be rated 480/277 volts, 3 phase, 4-wire with 100 percent neutral, 60 hz unless indicated otherwise on the drawings.
   2. Switchboards shall include all protective devices and equipment listed on drawings with necessary interconnections, instrumentation, and control wiring.

C. Enclosure
   1. Indoor switchgear shall be furnished with an NEMA 1 enclosure and outdoor switchgear with a NEMA 3R non walk-in enclosure unless indicated otherwise on the drawings.

D. Structure (Type 1 & 2)
   1. Switchboards shall be fully self-supporting structures with 90 inch tall vertical sections (excluding lifting eyes and pull boxes) bolted together to form required arrangement.
   2. Switchboard frame shall be die formed, 12 gauge steel with reinforced corner gussets. Frame shall be rigidly bolted to support cover plates (code gauge steel), bus bars, and installed devices during shipment and installation.
   3. All sections may be rolled, moved, or lifted into position. Switchboards shall be capable of being bolted directly to the floor without the use of floor sills.
   4. All switchboard sections shall have open bottoms and removable top plate(s) to install conduit.
   5. Type 1 front-access only switchboards shall be rear aligned for placement against a wall or free standing. Type 2 front/rear-access switchboards shall be front and rear aligned for free standing.
   6. Switchboards shall be UL listed.
   7. All covers shall be fastened by hex head bolts.

8. Provide hinged doors over metering compartments and individually mounted device compartments. All doors shall have concealed hinges and be fastened by hex head bolts.
9. Switchboard protective devices shall be furnished as listed on drawings and specified herein, including interconnections, instrumentation, and control wiring. Switchboards and devices shall be rated for the voltage and frequency listed on the drawings.
10. Switchboard current ratings, including all devices, shall be based on a maximum ambient temperature of 25 degree C per UL Standard 891. With no de-rating required, temperature rise of switchboards and devices shall not exceed 65 degrees C in a 25 degree C ambient environment.

E. Bus Bars
1. Bus bars shall be tin-plated copper. The bus bars shall have sufficient cross sectional area to meet UL 891 temperature rise requirements through actual tests. Phase and neutral bus ampacity shall be as indicated on the drawings. The neutral bus shall have the same ampacity as the phase bus.
2. Bus bars shall be mounted on high impact, non-tracking insulated supports. Joints in the vertical bus are not permitted.
3. Bus bars shall be braced to withstand mechanical forces exerted during short circuit conditions as indicated in drawings, but in no case less than 65 kA RMS SYM.
4. A-B-C bus arrangement (left to right, top to bottom, and front to rear) shall be used throughout to assure convenient and safe testing and maintenance. Where special circuitry precludes this arrangement, bus bars shall be labeled.
5. All feeder device line and load connection straps shall be rated to carry current rating of device frame (not trip rating).
6. The main incoming bus bars shall be rated for the main protective device frame size or main incoming conductors, if there is no main device.
7. Main horizontal bus bars shall be fully rated and arranged for future extensions.
8. All draw-out breaker primary connections shall be silver-plated. Breaker primary connections for stationary-mounted breakers shall have the same plating as the main bus.
9. The main bus and riser bus shall be fully isolated from the circuit breaker, instrument, and auxiliary compartments. The vertical bus shall be mounted on supports of high impact, non-tracking, flame-retardant, molded glass-reinforced polyester. Vertical bus in molded case breaker sections shall be extended to all compartments in the section including blank compartments that may be at the top and / or bottom of the section.
10. A copper ground bus, 1.0 sq inches minimum, shall be secured to the rear frame of each vertical section and shall extend through the entire length of the switchboard. The ground bus shall be provided with a 4/0 terminal for connection to the electrical system ground. A lug strap shall be provided for each vertical section for feeder ground cable terminations.
11. All bus hardware shall be high tensile strength, grade 5, zinc-plated steel. All bolted bus joints shall be provided with split-type lock washers.

F. Service Entrance
1. Switchboard Service Entrance sections shall comply with UL Service Entrance requirements including a UL service entrance label, incoming line isolation

barriers, and a removable neutral bond to switchboard ground for solidly grounded wye systems.

G. Incoming Line Section
   1. Incoming line section shall be the ampacity, wiring system, and type of connection as shown on the drawings.
   2. Incoming line shall be directly connected to the transformer on unit substations.

H. Breaker Compartment
   1. Type 1 Switchboards
      a. Switchboards rated 1200 amperes or less shall have group mounted main and group mounted feeder devices.
      b. Circuit breakers 1200 ampere and below shall be molded case circuit breakers.
      c. Switches 1200 ampere and below shall be fusible switches.
   2. Class 2 Switchboards.
      a. Switchboards rated 1200 amperes or less shall have individually mounted main device and group mounted feeder devices.
      b. Circuit breakers 1200 ampere and below shall be molded case circuit breakers.
      c. Switches 1200 ampere and below shall be fusible switches.

2.04 CIRCUIT BREAKERS & FUSIBLE SWITCHES

A. Molded Case Circuit Breakers
   1. Group mounted breakers shall be connected to the vertical bus by bolted connections.
   2. Individually mounted molded case circuit breakers shall be stationary mounted.
   3. Circuit breaker frames shall be constructed of a high-strength, molded, glass-reinforced polyester case and cover. Breakers shall have an overcenter, toggle handle-operated, trip free mechanism with quick make, quick break action independent of the speed of the toggle handle operation. The design shall provide common tripping of all poles. Breakers shall be suitable for reverse feeding.
   4. Breakers shall have ON and OFF position clearly marked on escutcheon. Breakers shall include a trip-to-test means on the escutcheon for manually tripping the breaker and exercising the mechanism and trip latch.
   5. Breakers shall include factory installed mechanical lugs. Lugs shall be UL listed and rated 75 degrees C.
   6. Breakers 150 amperes and smaller shall have a electronic trip unit with true digital RMS sensing trip units and an interchangeable rating plug to determine the breaker trip rating. They shall have an adjustable instantaneous with short time tracking function.
   7. Breakers 225 amperes and larger shall have digital electronic trip units as described in paragraph 2.05.
   8. Breakers shall be UL listed as 100 percent continuous duty rated unless noted otherwise on the drawings.

B. Insulated Case Circuit Breakers
   1. Insulated case circuit breakers shall be individually mounted.
   2. Main and tie breakers shall be manually or electrically operated, stationary or draw-out as indicated on drawings. Feeder breakers larger than 1200 amps shall

be manually or electrically operated stationary or draw-out as indicated on drawings.

3. Breakers shall be constructed of a high dielectric strength, glass reinforced insulating case. The interrupting mechanism shall be arc chutes. Steel vent grids shall be used to suppress arcs and cool vented gases. Interphase barriers shall to isolate completely each pole.
4. Breakers shall contain a true two-step stored energy operating mechanism which shall provide quick make, quick break operation with a maximum five-cycle closing time. Breakers shall be trip free at all times. Common tripping of all poles shall be standard.
5. Insulated Case circuit breakers shall be rated to carry 100 percent of their frame ampacity continuously.
6. A charging handle, close push-button, open push-button, and Off/On/Charge indicator shall be located on the breaker escutcheon and shall be visible with the breaker compartment door closed.
7. Where draw-out breakers are specified, the draw-out design shall permit the breaker to be withdrawn from an engaged position, to a test position, and to a disengaged position.
8. Breaker digital electronic trip units shall be as described in paragraph 2.05.

C. Low Voltage Power Circuit Breakers

1. Circuit breakers shall be individually mounted, draw-out, low voltage devices, metal frame construction, manually or electrically operated as indicated on drawings with features and accessories as described in this specification.
2. Interrupting mechanism shall contain arc chutes to suppress arcs and cool vented gases. Breaker cubicles shall not require "flash shields".
3. Inter-phase barriers of insulating material shall isolate each breaker pole.
4. The breaker front shall have standard padlocking provisions to lock the breaker open and mechanically trip-free. The padlock provision shall accept up to three padlocks with one-quarter to three-eighth inch diameter shanks.
5. Each draw-out breaker shall have provisions for up to 72 dedicated secondary disconnects.
6. All breaker control circuits and trip unit inputs / outputs shall be wired through the secondary disconnects.
7. Secondary disconnects shall be self-aligning. They shall automatically couple with mating points in the breaker cubicle with the breaker in the "test' or 'connect' position.
8. Circuit breakers shall have a rejection system that will only allow breakers of the correct ampere rating to be installed in the cubicle. A breaker with a higher short circuit rating may be mounted in the cubicle, if it has the same frame rating. Integrally fused breakers shall not be allowed to be mounted in cubicles for non-fused breakers.
9. Breakers shall have a rugged guide bar that ensures alignment of primary and secondary disconnects as the breaker is racked into the 'test' or 'connect' position.
10. Draw-out breakers shall have wheels to allow rolling the breaker into the cubicle, once it is installed on the draw-out rails.
11. Complete breaker operating status shall be available at the front of the breaker. Indicators in the breaker escutcheon shall provide closing spring status (charge / discharge), breaker main contact status (open / closed) and breaker draw-out position (connect / test / disconnect).

12. Circuit breakers shall be rated to carry 100 percent of the breaker current rating continuously. Provide breakers with current ratings as indicated on drawings.
13. Minimum interrupting ratings shall be as shown on the drawings.
14. Circuit breakers shall have true 30-cycle withstand capability equal to the breaker short time interrupting rating.
15. The circuit breaker shall not have a hidden instantaneous or a making current release to achieve short time withstand ratings.
16. Control voltage for electrically operated breakers 120 volts AC unless indicated otherwise on drawings.
17. Provide a true two-step, stored energy mechanism which shall provide quick-make and quick-break operation, including charge-after-close operation.
18. Closing springs shall be able to be discharged without closing main contacts.
19. Maximum closing time shall be 5 cycles at nominal control voltage.
20. Each breaker shall have a flush-mounted, retractable charging handle and close / open pushbuttons. The handle shall be able to completely charge an electrically operated breaker, if control power is lost during the charging operation.
21. All manual charge / close / open control operators shall be accessible from the breaker cubicle front with the breaker installed and the cubicle door closed.
22. Mechanical interlocks shall prevent moving the breaker from the 'connect', 'test', or 'disconnect' position unless the main breaker contacts are open.
23. The breaker shall be prevented from closing during any racking operation and shall remain trip free except in the 'test' or 'connect' position.
24. A mechanical interlock shall discharge the energy in the closing springs before the breaker is withdrawn from the cubicle.
25. The 'test' position shall permit operating the breaker while disconnected from power circuits.
26. Breaker digital electronic trip units shall be as described in paragraph 2.05.

D. Individually Mounted Fusible Switches
1. Bolted Pressure Switches shall be butt type contact construction with multiple, spring-loaded main arms and an arcing arm per pole. An over-center toggle mechanism shall provide quick make, quick break operation.
2. Switches shall have a molded insulating case and cover with integrally molded interphase partitions. All current carrying parts shall be silver plated copper.
3. Fusible switches shall be equipped with mounting provisions for UL class L fuses. Switches shall have an interrupting rating of 200 KAIC RMS SYM at 600V when used with class L fuses. Provide a complete set of UL class L fuses for each switch. (K rated when feeding a motor)
4. Switches shall be rated for making and breaking 12 times nameplate rated current at 600 VAC. Switches shall be rated to carry 100 percent of their frame ampacity continuously.
5. Switches shall be manually operated and stationary mounted. Switches shall have a front mounted operating handle for charging the closing springs and closing the switch and a push-button for opening the switch. Switches shall include a visible external ON - OFF indicator.
6. Switches shall have defeatable, front access, coin proof interlocks. Interlocks shall prevent opening switch door when switch is ON and prevent turning switch ON when door is open. Switches shall include provisions for padlocking the switch in the open position.

2.05 CIRCUIT BREAKER TRIP UNITS

A. Provide power management digital electronic trip unit for main and tie circuit breakers and feeder protection digital electronic trip unit for feeder circuit breakers as indicated on drawings and as specified below.

B. The trip unit shall provide protection from overload, short circuit, ground fault, and other optional functions as indicated on the drawings or specified. The protective trip unit shall consist of a solid state, microprocessor based programmer; tripping means; current sensors; power supply and other devices as required for proper operation.

C. As a minimum, the trip unit shall have the following protective functions:
   1. Adjustable current setting or long time pickup
   2. Adjustable long time delay
   3. Adjustable instantaneous pickup (Shall have OFF-ON function so it can be turned off for normal operation and on for maintenance to reduce ARC FLASH hazards)
   4. Adjustable ground fault pickup and delay with a switchable I2t ramp
      a. When used on emergency systems, provide ground fault alarm
      b. Do not provide ground fault on 120/208 volt systems
      c. Adjustable short time pickup and delay with a switchable I2t ramp

D. As a minimum, the trip unit shall include the following features:
   1. Long time and short time protective functions, shall have true RMS sensing technology
   2. Ground fault protective function, if provided, shall contain a memory circuit to integrate low level arcing fault currents with time, to sum the intermittent ground fault spikes
   3. High contrast liquid crystal display (LCD) unit shall display settings, trip targets, and the specified metering displays
   4. Multi-button keypad to provide local setup and readout of all trip settings on the LCD
   5. UL Listed interchangeable rating plug. It shall not be necessary to remove the trip unit to change the rating plug
   6. An integral test jack for testing via a portable test set and connection to a battery source
   7. A mechanism for sealing the rating plug and the trip unit
   8. Noise immunity shall meet the requirements of IEEE C37.90
   9. Display trip targets for long time, short time, and ground fault, if included

E. The feeder protection trip unit shall include the following metering functions, which shall be displayed on the LCD (if the manufacturers trip unit cannot incorporate the specified functions, separate device(s) with equal functions shall be provided for each breaker):
   1. Current, RMS, each phase

F. The main and tie breaker power management trip unit shall include the following metering functions, which shall be displayed on the LCD (if the manufacturers trip unit cannot incorporate the specified functions, separate device(s) with equal functions shall be provided for each breaker):
   1. Current, RMS, each phase
   2. Voltage, RMS, line - to - line, or line - to - neutral

3. Energy, KWH, total
4. Demand KWH, over an adjustable time period of 5 to 60 minutes
5. Peak demand, KW, user resettable
6. Real power, KW, line - to - line, line - to - neutral
7. Total (apparent) power, KVA, line to - line, line - to - neutral

2.06 WIRING

A. All control wire shall be type SIS. Control wiring shall be #14 AWG for control circuits, #12 AWG for close, trip, and potential transformer circuits, and #10 AWG for current transformer circuits. Ring type terminals shall be used on all CT, PT, close, and trip circuits. Wire bundles shall be secured with nylon ties and anchored to the assembly with the use of pre-punched wire lances or nylon non-adhesive anchors. All current transformer secondary leads shall first be connected to conveniently accessible shorting terminal blocks before connecting to any other device. Shorting screws with provisions for storage shall be provided. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips and provisions for #10 AWG field connections. Each control wire shall be marked to the origin zone/wire name/destination zone over the entire length of the wire using a UV cured ink process. Provide wire markers at each end of all control wiring. Plug-in terminal blocks shall be provided for all shipping split wires. Terminal connections to remote devices or sources shall be front accessible via doors above each circuit breaker.

B. Furnish fuse holders in switchgear when required.

C. Terminal blocks for external connections shall be heavy duty, molded, one-piece type, rated 600 volts, 50 amperes.

D. Terminal blocks shall be mounted in the rear cable compartment, easily accessible, away from the runbacks and cable terminals.

E. Furnish a bolted steel cover to enclose the terminal blocks.

F. NEMA 2-hole, long barrel crimp- type lugs shall be provided for all line and load terminations suitable for copper cable rated for 90 degrees C of the size indicated on the drawings.

G. Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.

H. Insulated, locking spade terminals shall be used on all #14 AWG terminations.

I. Insulated, ring terminals shall be used on all #12 and # 10 AWG terminations.

2.07 ACCESSORIES

A. Fuses
1. Manufacturer: Gould - Shawmut (or equal).
2. Interrupting Rating of all fuses shall be 200,000 RMS amperes.

B. Individually Mounted Fusible Switch Accessories
   1. Provide the following UL listed accessories where indicated on the drawings:
      a. 120 VAC Electric trip and control power transformer
      b. Blown - fuse Protector
      c. Provision for Key Interlock
      d. Auxiliary Switches with one single-pole, double-throw elements
      e. Integral, self-powered ground fault protection relay with mechanical ground fault indicator, test function, adjustable current pick - up and time delay, and current sensors as required. Ground fault relay shall have an internal memory circuit that integrates intermittent arcing ground faults with time.

C. Furnish nameplates for each device as indicated in drawings. Color schemes shall be as indicated on drawings.

D. Provide Transient Voltage Surge Suppression system where indicated on drawings and as specified in Section 26 43 13.

2.08 FACTORY TESTING

A. Perform all tests recommended by NEMA, IEEE and ANSI standards

B. Perform complete operational checkout of all functions.

2.09 FINISH

A. All steel surfaces shall be chemically cleaned prior to painting.

B. Exterior paint color shall be ANSI 61 Light Gray over phosphate - type rust inhibitor.

PART 3 EXECUTION

3.01 EXAMINATION

A. The following procedures shall be performed by the Contractor:
   1. Examine installation area to ensure there is enough clearance to install switchboard.
   2. Check concrete pads for uniformity and level surface.
   3. Verify that switchboards are ready to install.
   4. Verify field measurements are as shown on Drawings.
   5. Verify that required utilities are available, in proper location and ready for use.
   6. Beginning of installation means installer accepts conditions.

3.02 INSTALLATION

A. Contractor shall furnish and completely install all switchgear as shown on drawings and per manufacturer's instruction books

B. Install required safety labels including arc flash requirements.

C. All necessary hardware to secure the assembly in place shall be provided by the Contractor.

D. The equipment shall be installed and checked in accordance with the manufacturer's recommendations. This shall include but is not limited to the following:
   1. Checking to ensure that all relays and/or protective devices are set properly
   2. Checking to ensure that the pad location is level to within 0.125 inches per three foot of distance in any direction
   3. Checking to ensure that all bus bars are torqued to the manufacturer's recommendations
   4. Assembling all shipping sections, removing all shipping braces, and connecting all shipping split mechanical and electrical connections
   5. Securing assemblies to foundation or floor channels
   6. Measuring and recording Megger readings phase-to-phase, phase-to-ground, and neutral-to-ground (four wire systems only).
   7. Measuring and recording the impedance of the equipment to the building grounding electrode.
   8. Inspecting and installing all circuit breakers in their proper compartments.

3.03 FIELD QUALITY CONTROL

A. Inspect installed switchboards for anchoring, alignment, grounding, and physical damage.

B. Check tightness of all accessible electrical connections with a calibrated torque wrench. Minimum acceptable values are as specified in manufacturer's instruction manual.

C. Check any key interlock system for proper functioning.

3.04 ADJUSTING

A. Refer to manufacturer's instruction book to make adjustments to circuit breakers, doors, handles, etc., as required.

B. Set trip units as per engineer's recommendations.

3.05 FIELD TESTING

A. Perform all tests required and/or recommended by the commissioning specification, NETA, ANSI standards, and the manufacturer.

B. Perform complete operational checkout of all functions.

C. Perform primary injection current testing of all circuit breakers 400 amperes and larger to ensure proper settings and tripping functions.

3.06 CLEANING

A. Clean interiors of switchgear to remove construction debris, dirt, and shipping materials.

B. Repaint scratched or marred exterior surfaces to match original finish.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide circuit breaker type panelboards as indicated on drawings and as specified hereinafter.

1.02 RELATED SECTIONS

A. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables

B. Section 26 05 26: Grounding and Bonding for Electrical Systems

C. Section 26 05 53: Identification for Electrical Systems

D. Section 26 05 73: Power System Studies

1.03 REFERENCES

A. UL 67 Panelboards

B. UL 50 Cabinets and Boxes

C. NEMA PB 1

D. Federal Spec W-P-115C

1.04 SUBMITTALS

A. Submit the following product data for review:
   1. Shop drawings showing circuit breaker or fusible switch layout, dimensions, voltage, phasing, continuous current capacity, short circuit rating, series rating (if applicable)
   2. Conduit entry location, cable termination sizes, mounting

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D

B. General Electric

C. Eaton/Cutler-Hammer

D. Siemens Energy and Automation

2.02 PANELBOARD TYPES

A. Circuit breaker type lighting and appliance panelboards for 120/208 volts, 3-phase, 4-wire service shall be equipped with circuit breakers having AIC ratings as indicated on the drawings, but not less than 10,000 AIC. Panelboards shall be equal to:
   1. Square D, "N" series
   2. General Electric, type AQ
   3. Eaton/Cutler-Hammer, type PRL1A
   4. Siemens, type P1

B. Circuit breaker type lighting and appliance panelboards for 277/480 volts, 3-phase, 4-wire service shall be equipped with circuit breakers having AIC ratings as indicated on the drawings, but not less than 14,000 AIC. Panelboards shall be equal to:
   1. Square D, "N" series
   2. General Electric, Type AE
   3. Eaton/Cutler-Hammer, type PRL2A
   4. Siemens, type P2

C. Circuit breaker type power distribution panelboards for 120/208 volts, 3-phase, 4-wire service shall be equipped with circuit breakers having AIC rating as indicated on the drawings. Where AIC ratings are not shown on drawings obtain the rating requirements from the Architect. Panelboards shall be equal to:
   1. Square D, "I-Line" series distribution type
   2. General Electric, "Spectra" series distribution type
   3. Eaton/Cutler-Hammer, "PRL4B" distribution type
   4. Siemens, type P4 or P5, depending upon panelboard ampacity

D. Circuit breaker type power distribution panelboards for 277/480 volts, 3-phase, 4-wire service shall be equipped with circuit breakers having AIC rating as indicated on the drawings. Where AIC ratings are not shown on drawings, obtain the rating requirements from the Architect. Panelboards shall be equal to:
   1. Square D, "I-Line" series distribution type
   2. General Electric, "Spectra" series distribution type
   3. Eaton/Cutler-Hammer, "PRL4B" distribution type
   4. Siemens, type P4 or P5 depending upon panelboard ampacity

E. Where a power study is required by other sections and the results indicate that higher AIC ratings are required than shown on drawings, furnish panelboards and circuit breakers with AIC ratings in accordance with the power study.

F. Fusible switch type power distribution panelboards shall be Square D type QMB, Eaton PRL4F, GE Spectra Series and Siemen type P4/P5.

G. Provide fuses for fusible switch type distribution panelboards as specified in 26 05 00 and as shown on drawings. Provide R-clips in switches where Class R fuses are used.

H. Bus bars shall be copper.

I. Power distribution panelboards shall be a minimum 36" in width.

J. Power distribution panelboards shall be furnished with full-height bussing.

2.03 REQUIRED FEATURES

A. Provide circuit breakers with lugs (both main and branch circuit lugs) suitable and UL listed for both aluminum and copper conductors and rated for minimum 75 degrees C.

B. Provide electrically isolated factory installed neutral bus.

C. Provide a second, fully rated electrically isolated factory installed, neutral bus where called for on the drawings.

D. Provide separate ground bars complete with lugs or connectors on bar. Provide an additional copper isolated/insulated ground bar where indicated on drawings.

E. Panelboard assembly shall be enclosed in a steel cabinet. The size of the wiring gutters shall be in accordance with U.L. Standard 67. Fronts shall have door with matching trim, be of code gauge full finished steel with rust inhibiting primer and baked enamel finish.

F. Cabinets shall be equipped with spring latch and tumbler lock on door of trim. Doors over 48" long shall be equipped with three point latch and vault lock. All locks shall be keyed alike.

G. Surface mounted panelboards shall be provided with hinged trims such that devices, lugs, and gutters may be exposed without completely removing trim. Flush mounted panelboards shall have "easy-to-remove" trims.

H. Provide thermal magnetic circuit breakers which are fully rated and temperature rated for a 40 degrees C ambient. Breakers shall be quick-make, quick-break type with trip indication shown by handle position other than ON or OFF and with a common trip on all multi-pole breakers.

I. Refer to drawings for numbers of branch circuits, their ratings, number of poles and arrangements.

J. Surfaces of the enclosure and trim shall be properly cleaned and painted gray, ANSI 61.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install per manufacturer's recommendations and contract documents.

B. Ground separate ground bars to panel boxes and to the main service entrance ground bus with a code-sized equipment grounding conductor installed in the same conduit as the phase and neutral conductors.

C. Install circuits using a common neutral in accordance with the National Electrical Code.

D. Provide six circuit breaker handle lock-on devices for each branch-circuit panelboard, installed as directed by Owner's Representative, to prevent unauthorized personnel from turning off circuits to controls, unit heaters, clocks, night lights. Turn spare lock-on devices over to the Owner's Representative.

E. Provide typed directory cards under plastic on the doors of branch circuit panelboards. Directories shall indicate devices being served including space numbers or space names in which devices or fixtures are located. Space names and numbers shall match the graphics installed if different from the space names and numbers on the drawings.

F. Provide shunt trip circuit breakers for kitchen equipment branch circuits under range hoods.

G. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacturer's recommendations.

H. Check all installed panels for proper grounding, fastening, and alignment.

I. Remove debris from panelboards and wipe dust and dirt from all components.

J. Repaint marred and scratched surfaces with touch-up paint to match original finish.

K. Where panelboards are installed flush mounted, provide a minimum of (6)-1" spare conduits stubbed out above ceiling for future use by owner.

L. Where multiple panels are flush mounted in public areas, provide enclosures and trims of matching dimensions.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide switches, receptacles, and other wiring devices as indicated on drawings.

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Arrow Hart

B. Eagle

C. Hubbell

D. Leviton

E. Pass and Seymour

F. Novitas, Inc

G. Hubbell numbers are used unless otherwise noted, but products of equivalent quality by named manufacturers will be acceptable.

2.02 DEVICE COLORS

A. Provide IVORY colored devices where available, unless otherwise noted.

B. Provide RED colored devices where available when connected to the emergency power system, unless otherwise noted.

2.03 SWITCHES

A. 15-Amp, 120/277 VAC, Heavy Duty Specification Grade:
   1. Single pole toggle: Hubbell No. HBL1201
   2. Three-way toggle: Hubbell No. HBL1203
   3. Single pole toggle, weatherproof: Hubbell No. HBL1201 with Hubbell No. HBL1795 weatherproof plate
   4. Single pole toggle with pilot light (120 VAC): Hubbell No. HBL1201IL

B. 20-Amp, 120/277 VAC, Heavy Duty, Specification Grade:
   1. Single pole toggle: Hubbell No. HBL1221
   2. Three-way toggle: Hubbell No. HBL1223
   3. Single pole toggle, weatherproof: Hubbell No. HBL1221 with Hubbell No. HBL1795 weatherproof plate
   4. Single pole toggle with pilot light (120 VAC): Hubbell No. HBL1221IL

C. Occupancy Sensor Switches, 120/277 VAC:
   1. Wall mounted, automatic on/manual on, passive infrared with ambient light sensing, minimum 1000 s.f. room coverage and 500 s.f. desktop activity coverage, 800 W @ 120V and 1200 W @ 277V: Leviton No. ODS10-ID
   2. Ceiling Mounted, 360 Degrees, 1,500 square feet coverage area - Leviton OSC15-10W

2.04 RECEPTACLES

A. 15-Amp, 125 VAC, Heavy Duty, Specification Grade:
   1. Duplex type: Hubbell No. HBL5252
   2. Ground fault circuit interrupter: Hubbell No. GF5262
   3. Duplex, tamper resistant: Hubbell No. HBL8200SG

B. 20-Amp, 125 VAC:
   1. Duplex type: Hubbell No. HBL5352
   2. Ground fault circuit interrupter: Hubbell No. GF5362
   3. Duplex, tamper resistant: Hubbell No. HBL8300SG

C. Weatherproof Type Cover:
   1. Damp location and outdoors protected from weather: Hubbell No. CWP26H
   2. Wet location and outdoors exposed to weather: Hubbell No. WP26MH

D. Miscellaneous Receptacles:
   1. Single 20-amp, 125/250 VAC, 3 pole, 4 wire, NEMA 14-20R: Hubbell No. HBL6810
   2. Single 20-amp, 125/250 VAC, 3 pole, 4 wire, 3 phase, NEMA 15-20R: Hubbell No. HBL8420
   3. Single 30-amp, 125/250 VAC, NEMA 14-30R: Hubbell No. HBL9430A
   4. Single 50-amp, 125/250 VAC, NEMA 14-50R: Hubbell No. HBL9450A

E. Floor Mounted:
   1. Standard Floor Box, 1 to 3 gang:
      a. Cast Iron (slab on grade applications): Walker No. 880CS-1 series
      b. Stamped Steel (elevated slab applications): Walker No. 880S series
      c. Combination Carpet & Tile Flange: Brass - Walker No. 817B (1 gang), Black - Walker No. 817PCC-BLK (1 gang) or Brown - Walker No. 817PCC-BRN (1 gang)
      d. Cover Plate with Flip Lids: Brass - Walker No. 828R (1gang), Black - Walker No. 828PR-BLK (1 gang) or Brown - Walker No. 828PR-BRN (1 gang)
   2. Floor Box, Multi-service, 4 compartment:
      a. Cast Iron (slab on grade applications): Walker No. RFB4-CI-1

b. Stamped Steel (elevated slab applications): Walker No. RFB4
c. Flanged Cover and Trim Ring: Walker No. S36CCTC with Aluminum, Black or Brass finish

3. Furniture Feed, fire-rated, poke-thru device for power and voice/data service:
   a. Service Fitting: Hubbell No. FRF3
   b. Through-Floor Fitting: Hubbell No. PT73SD
   c. Finish Color: Gray or Ivory
4. Pedestal type, 2 gang, fire-rated poke-through device for power and voice/data:
   a. Pedestal Housing and Faceplates: Hubbell No. FR280 / SS2309D / SS2309SL
   b. Through-Floor Fitting: Hubbell No. PT27A

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Mounting:
   1. Mount switches 46" above the finished floor to center line of switch unless noted otherwise.
   2. Mount receptacles 18" above the finished floor to center line of receptacle unless noted otherwise.
   3. Install receptacles shown on the drawings as "special mounting height" at mounting height indicated on drawings. Where no mounting height is given and receptacles are above counters, mount receptacles with centers 4" above top of counter. If the counter has a backsplash, receptacles shall be mounted with centers 4" above top of backsplash. Where special mounting height receptacles are not above counters and no mounting height is indicated, receptacle mounting heights shall match adjacent light switches or above counter receptacles. Coordinate the installation of all special mounting height receptacles with architectural design.
   4. Work devices to nearest block course using proper type outlet boxes as specified under Section 26 05 35. Check architectural and furniture drawings for counter (desk, special booth, etc.) locations. Mount devices above work counters. Verify other special mounting conditions and locate devices as required.

B. Polarity: Wire receptacles so that the hot wire, neutral wire and ground wire connect to the proper terminals.

C. Grounding: Install a No. 12 green ground wire from device grounding terminal back to grounding bus in panelboard, as noted on drawings.

D. Install floor boxes or poke-through fittings where shown on drawings with receptacle and/or communication outlet quantities as shown on drawings.
   1. Install one 3/4" conduit from power compartment to a junction box above accessible ceiling for each floor box. Box configuration to allow interconnection from end power compartment to opposite end power compartment.
   2. Install one dedicated 1" conduit from each communications compartment, stubbed out above accessible ceiling for each floor box.

E. Install receptacles with ground pin up.

F. For GFCI receptacles, do not utilize feed-thru feature, unless required by drawings.

G. A single receptacle installed on an individual branch circuit shall have an ampere rating of not less than that of the branch circuit.

END OF SECTION

SECTION 26 27 27

WIRING DEVICE PLATES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide device plates on switches, receptacles, telephone outlets and miscellaneous devices.

1.02 RELATED SECTIONS

A. Section 26 27 26: Wiring Devices

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide specification grade stainless steel device plates from the wiring device manufacturer.

B. Provide specification grade nylon device plates from the wiring device manufacturer. Provide device plates in colors to match the associated devices.

C. Provide cast alloy or stamped metal plates on exposed switches and receptacles.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install device plates in full contact with wall surface. Plates shall not project out from the wall.

B. Install device plates in full contact with surface mounted box. Plates shall not project out from the edge of the box.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Sections 26 05 00.

B. Provide horsepower rated, quick-make, quick-break, safety switches with the number of poles and fuses as required. For 240 volt switches use general duty type. For 600 volt switches, use heavy duty type. Provide Class R fuse in clips in each type.

C. Switches shall have arc shields, be of enclosed construction and fusible or non-fusible as indicated. Switches shall be rated for either 240-volt AC or 600-volt AC service as required.

D. Switches shall be capable of interrupting locked rotor currents of motors which they serve.

E. Switches shall have UL listed lugs suitable for 75deg.C copper or aluminum conductors.

F. Switches shall be pad lockable in the open (off) position.

G. Fusible switches shall have a UL listed short circuit rating of 100,000 amps rms with fuses applied.

1.02 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D

B. General Electric

C. Eaton/Cutler-Hammer

D. Siemens Energy Automation

E. Provide Square D Series HU-660, six-pole safety switches for part-winding or two-speed motors requiring remote disconnects.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Provide non-fused switches at remote motor locations (rain-tight where required) as indicated on drawings and as required by NEC. Do not use if fault current exceeds 10,000 amperes.

B. Identify safety switches with Bakelite nameplates in accordance with Section 26 05 00.

C. Use NEMA 1 for interior use and NEMA-3R for exterior use.

D. Provide two normally open and two normally closed auxiliary contacts for disconnect switches used to serve fan system motors including supply fans, return air fans, exhaust fans, make up air fans, and relief air fans for electrical interlock with mechanical control circuits.

E. Switches used for service equipment shall be Heavy Duty type, UL listed for service equipment use.

END OF SECTION

SECTION 26 29 13

MOTOR STARTERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Motor starters

B. Provide wiring in accordance with Section 26 05 00.

1.02 RELATED SECTIONS

A. Division 23: HVAC

B. Section 26 05 19: Low Voltage Electrical Power Conductors

C. Section 26 05 33: Raceways and Conduit Systems

D. Section 26 05 53: Identification for Electrical Systems.

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 STARTERS

A. Design: NEMA standard, UL listed and CSA approved.

B. Ratings: A/C symmetrical ratings of 50,000 amps for 460 volt equipment and 35000 amps for equipment of lower voltages. Provide higher ratings where available fault current exceeds these ratings and as called for on drawings.

C. Size: In accordance with NEMA standards.

D. Acceptable manufacturers: Allen Bradley, Square D, Eaton, General Electric.

E. Starters shall include melting alloy overloads in each phase, and auxiliary interlocks as required for proper system operation.

F. Provide starters mounted in NEMA 1 general purpose enclosures, unless location of starter dictates other NEMA enclosure. For example, provide NEMA Type 3R enclosures for outdoor use or NEMA Type 7 enclosures for hazardous areas.

G. Provide Hand-Off-Automatic selector switches in each starter.

H. Provide reduced voltage starters as shown on the drawings.
   1. Auto Transformer: Closed transition, 50%, 65%, 80%, taps, set at 50%
   2. Wye-Delta starters: Closed transition type

I. Provide 120 volt control transformers in each starter, individually fused from the line side of the starter using two cartridge fuses and one fuse in the secondary. Size transformers to carry the holding coil circuit and other connected devices.

J. Provide lockable combination starters with motor circuit protectors sized in accordance with the NEC Article 430.

K. Provide built-in power factor correction capacitors on motors 50 horsepower and larger to correct the power factor to 95%. Connect capacitors between the contactor and overload relays.

L. Pushbutton station, selector switches, and pilot lights:
   1. Oiltight, manufacturer's standard unit
   2. Pushbutton station: Momentary contact type with green start button, red stop button, and legend plate
   3. Selector switches: Standard knob maintained contact type with legend plate
   4. Pilot lights: 120 volt lamps with green glass color cap

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install motor starters in accordance with manufacturer's recommendations and requirements of NEC.

B. Provide thermal overloads at system startup in accordance manufacturer's recommendation for specific application.

C. Connect Divisions 21, 22, and 23 equipment ready for operation.

D. Coordinate equipment locations and starter sizes with Divisions 21, 22 and 23 Contract Documents, submittals, and shop drawings.

E. Verify phase rotation of motors with Divisions 21, 22 and 23.

F. Identify starters and controls as required by Section 26 05 00.

END OF SECTION

SECTION 26 41 13

LIGHTNING PROTECTION SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide labor, materials and equipment required for completion of a functional system of air terminals, conductors, grounds, and other components necessary for protection against damage by lightning.

C. System shall be concealed, with only air terminals and roof conductors visible.

D. Provide a UL Inspection Certificate upon completion of work.

1.02 RELATED SECTIONS

A. Division 07: Roofing and flashing.

B. Section 26 05 26: Grounding and Bonding for Electrical Systems

1.03 REFERENCES

A. The lightning protection system shall comply with the latest issue of the following standards.
   1. NFPA 780 Standard for the Installation of Lightning Protection Systems
   2. UL 96A Installation Requirements for Lightning Protection Systems
   3. LPI-175 Lightning Protection Institute

1.04 SUBMITTALS

A. Provide shop drawings, list of material, and details to Engineers for approval prior to commencement of the installation. The drawings shall show the extent of the system layout designed specifically for the contract project.

1.05 QUALITY ASSURANCE

A. The installation shall be by a UL listed installer.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers:
   1. Heary Brothers Lightning Protection, Inc.
   2. Thompson Lightning Protection, Inc.
   3. Robbins Lightning Protection, Inc

4. Harger Lightning & Grounding

2.02 MATERIALS

A. All materials used in the installation shall be new and shall comply in weight, size and composition as required by UL 96A and NFPA 780 and shall be labeled or listed by Underwriters Laboratories Inc. for use in lightning protection systems. The system furnished under this specification shall be the standard product of a manufacturer regularly engaged in the production of lightning protection equipment. The manufacturer shall be listed by UL as a recognized manufacturer of lightning protection components.

B. Class I materials shall be used on structures that do not exceed 75 feet in height and Class II materials shall be used on structures that are 75 feet or higher above average grade.

C. Copper materials shall not be mounted on aluminum surfaces including Galvalume, galvanized steel and zinc; this includes these materials that have been painted.

D. Aluminum materials shall not come into contact with earth or where rapid deterioration is possible. Aluminum materials shall not come into contact with copper surfaces.

2.03 AIR TERMINALS

A. Air terminals shall project a minimum of ten inches above the object or area it is to protect and shall be located at intervals not exceeding 20'-0" along ridges and along the perimeter of flat or gently sloping roofs (flat or gently sloping roofs include roofs that have a pitch less than 3:12). Flat or gently sloping roofs exceeding 50'-0" in width shall be protected with additional air terminals located at intervals not exceeding 50'. Air terminals shall be located within two feet of roof edges and outside corners of protected areas.

B. Air terminals shall be installed on stacks, flues, mechanical units and other metallic objects not located within a zone of protection and which have an exposed metal thickness less than 3/16 of an inch. Objects having an exposed metal thickness 3/16 of an inch or greater shall be connected to the lightning protection system as required by the specified standards using main size conductor and bonding plates having a minimum of 3 square inches of surface contact area.

C. Air terminal bases shall be securely fastened to the structure in accordance with the specified standards including the use of adhesive that is compatible with the surface it is to be used on or stainless steel fasteners.

D. Main conductors shall be sized in accordance with the specified standards for Class I or Class II structures and shall provide a two way horizontal or downward path from each air terminal to connections with the ground system. Conductors shall be free of excessive splices and no bend of a conductor shall form a final included angle of less than neither 90 degrees nor have a radius of bend less than 8 inches.

E. Down conductors shall be sized in accordance with the specified standards and in no case shall be smaller than the main roof conductor. Down conductors shall be spaced at intervals averaging not more than 100 feet around the perimeter of the structure. In no case shall a structure have fewer than two down conductors. Where down conductors are

installed exposed on the exterior of a structure and are subject to physical damage or displacement, guards shall be bonded at each end.

F. In case of structural steel frame construction, down conductors may be omitted and roof conductors shall be connected to the structural steel frame at intervals not exceeding 100 feet along the perimeter of the structure.

2.04 ROOF PENETRATIONS

A. Roof penetrations required for down conductors or for connection to structural steel framework shall be made using thru-roof assemblies with solid riser bars and appropriate roof flashing. Conductors shall not pass directly through the roof. The roofing contractor shall furnish and install the materials required to properly seal all roof penetrations of the lightning protection components and any additional roofing materials or preparations required by the roofing manufacturer for lightning conductor runs to assure compatibility with the warranty for the roof including roof pads that may be required to protect the roof under each of the lightning protection components.

2.05 GROUND TERMINATIONS

A. Ground electrodes shall be copper and a minimum 3/4" diameter and 10 feet long. A ground electrode shall be provided for each down conductor. The down conductor shall be connected to the ground electrode using a bronze ground rod clamp having a minimum of 1-1/2" contact between the ground electrode and the conductor measured parallel to the axis of the ground electrode, or by an Ultraweld exothermically welded connection. Ground electrodes shall be located a minimum of 2 feet below grade and shall be installed below the frost line where possible (excluding shallow topsoil conditions).

B. Where the structural steel framework is utilized as the down conductor for the system, ground terminals shall be connected to columns around the perimeter of the structure at intervals averaging not more than 60 feet apart. Columns shall be grounded using either bonding plates have 8 square inches of surface contact area or by Ultraweld exothermically welded connections.

C. All ground electrodes shall be interconnected with a ground loop conductor on structures that exceed 60 feet in height. The ground loop conductor shall be sized in accordance with the specified standards and in no case shall be smaller than the main roof conductor.

2.06 EQUIPOTENTIAL GROUNDING

A. Common interconnection of all grounded systems within the building shall be ensured by interconnecting to the lightning protection system using main size conductor and fittings.

B. This interconnection shall include but is not limited to the electrical service, telephone and antenna system grounds as well as all underground metallic piping systems including water, gas and sewer. Interconnection to a gas or water line shall be made on the customer's side of the meter. Connection to gas line must be approved by the gas utility.

C. Grounded metal bodies located within the required bonding distance as determined by the bonding distance formula in the latest edition of NFPA-780 Standard for the Installation of

Lightning Protection Systems shall be bonded to the lightning protection system using the required bonding conductors and connections.

2.07 SURGE PROTECTION

A. Surge suppression shall be provided at all power service entrances and at entrances of conductive signal, data and communication services.

PART 3 EXECUTION

3.01 INSTALLATION

A. The installation shall be installed by an UL listed lightning protection installation company that is licensed as a lightning protection installer in the project state.

3.02 COORDINATION

A. Coordinate the installation of the lightning protection system with other trades.

B. Coordinate all roof penetrations, fasteners and adhesive with the roofing contractor prior to installing any materials on the roof.

3.03 INSPECTION AND CERTIFICATION

A. New Structures
   1. Upon completion of the installation of the lightning protection system the contractor shall furnish the UL Certificate of Compliance issued by Underwriters Laboratories Inc.

B. Additions or Renovations
   1. If the protected structure is an addition to or is attached to an existing structure that does not have a functioning lightning protection system, the contractor shall certify that the new system installed complies with the specified standards and shall advise the owner on the lightning protection work required on the existing structure so that a Certificate of Compliance may be obtained.
   2. If the protected structure is an addition to or is attached to an existing structure that does have a lightning protection system the contractor shall advise the owner of any additional work that may be required in order to bring the existing lightning protection system into compliance with the specified standards and thus qualify for a Certificate of Compliance from Underwriters Laboratories Inc.

END OF SECTION

SECTION 26 43 13

TRANSIENT VOLTAGE SURGE SUPPRESSION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with provisions of Sections 26 05 00.

B. Provide three phase surge protection devices (TVSS) as shown on the drawings having the electrical characteristics, ratings and modifications as specified herein.

1.02 RELATED SECTIONS

A. Section 26 05 19: Low Voltage Electrical Power Conductors

B. Section 26 05 26: Grounding and Bonding for Electrical System

C. Section 26 05 33: Raceways and Conduit Systems

D. Section 26 24 13: Switchboards

E. Section 26 24 16: Panelboards

1.03 REFERENCES

A. ANSI/IEEE C62.11 - Standard for Metal-Oxide Surge Arresters for AC Power Circuits

B. ANSI/IEEE C62.33 - Standard Test Specifications for Varistor Surge Protection Devices

C. ANSI/IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Systems

D. ANSI/IEEE C62.45 - IEEE Standard Guide on Surge Testing for Equipment Connected to Low -Voltage AC Power Circuits

E. NEMA Standard LS-1 - Low-Voltage Surge Protective Devices

F. NFPA 70 - National Electrical Code

G. UL 1283 - UL Standard for Safety Electromagnetic Interference Filters

H. UL 1449 - UL Standard for Safety Transient Voltage Surge Suppressors

1.04 SUBMITTALS

A. Submit product data sheets and descriptive bulletins including proof of the following listings:
   1. UL 1283 listing

2. UL 1449 2nd Edition listing
3. Manufacturer ISO 9000 - 2001 certification.

B. Voltage Clamping TVSS devices
1. Submit test data of actual let through voltage for the ANSI/IEEE C62.41, table 4, location category B3/C1 at the 90 degree phase angle tested in accordance with NEMA LS-1 for L-L, L-N, L-G, N-G from a recognized independent testing laboratory.
2. Provide a complete diagram of all devices used in the test including lengths of conductors and where voltages were measured.

C. Sine Wave Tracking TVSS devices
1. Submit test data of actual let through voltage for the ANSI/IEEE C62.41, table 3, location category A1 at the 90 degree phase angle for L-L, L-N, L-G, N-G from a recognized independent testing laboratory.
2. Provide a complete diagram of all devices used in the test including lengths of conductors and where voltages were measured.

D. Provide electrical/mechanical drawings showing the unit dimensions, weights, installation instruction details and wiring configuration for retrofit mounting applications.

PART 2 PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. TVSS Equipment Ratings
1. Provide equipment with AIC rating equal to or greater than the fault current available at the equipment being protected. (Refer to drawings)
2. Provide equipment with each mode rated for the following surge current levels appropriate to the capacity of the equipment being protected:
a. 600-A Bus or less: 120,000-amps service entrance equipment
b. 600-A Bus or less: 40,000-amps non-service entrance

B. TVSS Performance Requirements
1. Voltage Clamping TVSS Device(s). Install on service entrance equipment and on equipment within 30 linear feet of the service entrance as installed in the field.
a. Provide Voltage Clamping levels equal to or less than the following levels for the Category B3/C1 wave at the 90-degree phase angle measured from zero volts to the peak of the let thru:
1) 480/277-volt three phase "wye"
(a) L-L: 1,020-volts
(b) L-N: 590-volts
(c) L-G: 590-volts
(d) N-G: 1,372-volts
2) 208/120-volt, three phase "wye"
(a) L-L: 735-volts
(b) L-N: 425-volts
(c) L-G: 425-volts
(d) N-G: 595-volts

C. TVSS Features
   1. Provide status indicators for each mode on the face of the TVSS enclosure.
   2. Provide safety labels identifying the equipment, UL label, the AIC rating of the equipment and the modes of protection.
   3. Provide dry contacts for remote monitoring.

D. Provide products from the same TVSS manufacturer.

2.02 ACCEPTABLE MANUFACTURERS

A. Control Concepts (Liebert)

B. Surge Suppression, Inc.

C. Current Technology

2.03 WARRANTY

A. Provide a 10 year warranty including materials from the date of owner occupancy in the event of any evidence of failure of the TVSS system.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Wall or equipment mounted TVSS
   1. Mount all three phase TVSS units adjacent (close nippled) to the switchboard/panelboards being protected in a NEMA 12 enclosure.
   2. Install, connect and ground the TVSS device and enclosure in accordance with the manufacturer's instructions, the National Electrical Code and wiring diagrams shown on the drawings.
   3. Provide a 30/3 branch circuit breaker in each panel to be protected for connection of suppressor to panel bus.
   4. Coordinate dry contact connections with fire alarm or energy management vendor. (Refer to drawings)
   5. Provide #10 minimum THHN wire minimized to maximum length of 18" between the device and the circuit breaker.
   6. Provide manufacturer flush mounting kit where required by drawings.

B. TVSS Mounted Integral to Equipment
   1. Coordinate TVSS equipment installation with switchgear/panelboard vendor.
   2. Provide #10 minimum THHN wire minimized to maximum length of 18" between the device and the circuit breaker.

3. Provide a 30/3 branch circuit breaker in each panel to be protected for connection of suppressor to panel bus.
4. Coordinate dry contact connections with fire alarm or energy management vendor. (Refer to drawings)
5. Place all monitoring diagnostic features on the front face of the switchgear mounted devices.

END OF SECTION

SECTION 26 51 13

INTERIOR LIGHTING FIXTURES, LAMPS AND BALLASTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide labor, material, equipment and fixtures for interior lighting including necessary hangers and lamps. Fixtures shall be completely wired, controlled and securely attached to supports.

C. Fixtures and associated components shall be new, of good quality and shall arrive on the jobsite in original packaging.

D. Fixtures shall be listed by a Nationally Recognized Testing Laboratory, and shall meet required local, state and national building codes and regulations. Luminaries installed in exterior locations, unprotected from precipitation, shall be listed for wet location use. Luminaries installed in protected exterior areas or in interior areas subject to extreme humidity shall be listed for damp location use.

1.02 RELATED SECTIONS

A. Section 26 56 00: Exterior Lighting Accessories

1.03 BIDDING AND SUBSTITUTION

A. Comply with the provisions of Division 01.
   1. Bidders requesting approval of brands other than those specified by name/catalog number in that lighting fixture schedule or these specifications shall submit their requests not later than fifteen (15) business days before the scheduled bid due date. Contractors will be notified of approval in the form of an addendum to the bid documents for those products, which have been approved as equal. The Owner has no obligation to review or consider any substitutions after the bid date or pre-bid review period.
   2. Where indicated on schedule, substitution requests shall be accompanied by a working fixture sample - 120V, complete with lamp and cord/plug. These samples shall be shipped separately with return shipment guaranteed at the bidder's expense to the location designated by the Architect. Additional information, including names of projects and contact information (Owner, and Architect/Lighting Designer) for recently completed installations, will be required for these fixtures. If approved, these sample fixtures may not be installed on the project.

B. Provide unit pricing for each specified or alternate fixture to include lamp, freight, and contractor mark-up.

C. The Contractor shall be provided with entire lighting specification (including fixture illustrations and sketches). Contractor shall provide each specified manufacturer with complete information about the luminaries they will supply.

1.04 SUBMITTALS

A. Submit product data for review.

B. Initial lighting submittal shall be complete, clearly indicating fixture manufacturer, model number, voltage, ballast manufacturer, options, finish, mounting type/special mounting details for each fixture specified on the project. The Architect reserves the right to request a shop drawing where information shown on the catalog cut sheets is incomplete. Partial submittals will not be accepted. Re-submittals, where required, may be partial as determined by the submittal review.

C. Where custom fixtures, or row mounted fluorescent fixtures are required on the project, scaled fabrication drawings shall be submitted which indicate ballast locations, internal fixture wiring, support locations, power feed locations, materials and finishes. Contractor shall provide field dimensions for fabrication as required.

D. Submit lamp product data for each specified lamp type.

E. Fixture details shown on contract documents may be modified by the manufacturer if needed, providing all of the following are met:
   1. Fixture performance is equal or improved.
   2. Structural, mechanical, electrical, safety and maintenance characteristics are equal or improved.
   3. Cost to the Owner is reduced or equal.
   4. Modifications are clearly identified on the fixture submittal for Architect review and approval.

F. Fixture submittals shall be arranged numerically as specified.

1.05 QUALITY ASSURANCE

A. Fixtures and workmanship shall be guaranteed free of defects and fully operational for a minimum of one year after project acceptance by the Owner. Any fixtures or workmanship found to be defective during the warranty period shall be replaced by the contractor at no cost to the owner for labor or materials.

B. Fluorescent ballasts shall have an extended three-year manufacturer's warranty against defects in workmanship or material. HID ballasts shall have a two-year warranty against defects in workmanship or material. Warranty shall include in-warranty service program providing for payment of authorized labor charges associated with the replacement of inoperative ballasts within this warranty period.

PART 2 PRODUCTS

2.01 GENERAL MATERIAL REQUIREMENTS

A. ACCEPTABLE MANUFACTURERS
   1. Fixture Manufacturers shall be as indicated on fixture schedule.
      a. Fluorescent Troffers:
         1) Columbia
         2) Lithonia
         3) LSI/Innovator
         4) Metalux
         5) Williams
         6) Daybrite
      b. Downlights:
         1) Prescolite
         2) Lithonia/Gotham
         3) Spectrum
         4) Omega
      c. Exit Lights and Egress Lights:
         1) Dual-Lite
         2) Lithonia
         3) Emergi-lite
         4) McPhilben

B. Luminarie hardware shall be concealed. Fasteners shall be manufactured of non-magnetic stainless steel or anodized aluminum, except in indoor applications where galvanized steel shall be acceptable.

C. Fixtures shall be free of light leaks and shall be designed to provide sufficient ventilation of lamps and ballasts including vent holes where required. Exterior fixtures shall have wire mesh corrosion resistant screens in the vent holes.

D. Fixture housings for linear fluorescent lamps shall be No. 22 gauge steel, bonderized or equal rust protection, or No. 16 gauge aluminum rigid construction, suitable for continuous row mounting where indicated.

E. Fixture housings for incandescent or HID lamps shall be:
   1. Interior locations
      a. No. 20 gauge steel, bonderized or equal rust protection, or
      b. No. 16-gauge aluminum rigid construction.
   2. Exterior locations
      a. No. 18 gauge steel, bonderized or equal rust protection, or
      b. No. 14-gauge aluminum rigid construction.

F. Fixtures shall be constructed with a minimum number of joints. Exposed metal joints shall be welded, filled with weld material, ground smooth and made free of light leaks. Unexposed joints shall be welded, screwed or bolted. Soldered joints are not acceptable. Self tapping methods or rivets for fastening removable parts used to gain access to

electrical components requiring service or replacement, or for fastening electrical components or their supports, will not be acceptable.

G. Sheet metal work shall be free from tool marks and dents and shall have accurate angles bent as sharp as compatible with the gauges of the required metal. All intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after assembly. Edges shall be finished such that no sharp edges are exposed. Miters shall be in accurate alignment. Sheet metal work shall be properly fabricated so that planes will not deform due to operating and varied weather conditions.

H. Cast or extruded parts of luminaries shall be close grained, rigid, true to pattern, of ample weight and thickness, and properly fitted, filed, ground, and buffed to provide finished surfaces and joints free of imperfections or discolorations.

I. Housings for fluorescent and HID fixtures shall be designed to ensure electrical components are easily accessible and replaceable, without removing the fixture body from its mounting.

J. Finishes
   1. Ferrous mounting hardware and accessories shall be finished using either a galvanic or phosphate primer/baked paint process to prevent corrosion and discoloration of adjacent materials.
   2. For weatherproof and vapor tight installations, painted finishes of fixtures and accessories shall be weatherproof enamel using proper primers or hot dipped galvanized and bonderized epoxy, in accordance with the manufacturer's requirements. Finish of painted surfaces shall have a life expectancy of not less than twenty years.
   3. Finishes for interior luminaries shall be baked enamel unless specified otherwise. Concealed interior and exterior surfaces, including hardware, yokes, brackets, etc., shall be finished matte black.
   4. Pendant hangers, where required, shall be chemically resistant, weatherproof baked enamel finish.
   5. Where aluminum parts come in contact with bronze parts, apply to both surfaces a coating material to prevent corrosion.

K. Fixtures with an adjustable lamp and using a lamp with an asymmetrical light pattern shall have an aiming stop which can be permanently set so that the lamp shall remain correctly positioned after service or relamping.

L. Fixtures shall be designed, manufactured and wired to conform to NEC article 300.22 where the fixtures are recessed in a hung ceiling, and the space above the ceiling is utilized for supply or return air plenum.

M. Incandescent luminaries shall include a thermal protection device as required by NEC 410.65.

2.02 LAMPHOLDERS

A. Lampholders shall be rigidly and securely attached to the luminaire and shall hold lamps securely against normal vibrations and maintenance handling. Lampholders shall be

suitable for specified lamps, and set to position the lamps in optically correct spacing and relationship to lenses, reflectors, filters and baffles.

1. Lampholders for incandescent, HID and halogen lamps shall be porcelain with nickel-plated copper screw shells.
2. Lampholders for pulse-start Metal halide shall be 4 kV pulse-start rated, porcelain with nickel-plated copper screw shells.
3. Lampholders for fluorescent shall be white heat-resistant plastic. Lampholders intended for operation with an open circuit voltage in excess of 300 volts shall be the safety type, designed to open the supply circuit when the lamp is removed from the socket. Where fluorescent lamps are installed in unenclosed fixtures, a minimum of two lamp retaining clips per lamp shall be provided.

2.03 REFLECTORS

A. Reflector Cones:
   1. Provide 45 degree lamp and lamp image cut-off unless otherwise specified. In fixtures where upper reflector is separate from cone, cut-off shall be 45 degrees unless otherwise specified.
   2. Reflector cone retention devices shall not deform the cone in any manner.
   3. Plastic materials shall not be used for reflector cones or aperture plates.
   4. Fixtures, which require pressure to be applied to the finished surface of the reflector in order to remove the reflector, are not acceptable.
   5. Ceiling flange shall be formed as an integral part of the cone or fixture reflector assembly and shall have identical color and finish as the cone, except as scheduled. The flange surface shall be perpendicular to the cone axis and shall be of appropriate width to adequately cover the ceiling opening without light leaks, or visibility of fixture housings.

B. Aluminum Reflectors:
   1. Aluminum reflectors and reflecting cones shall be manufactured of uniform gauge, not less than 0.032" thick, high purity aluminum Alcoa 3002 alloy free of spin marks or other defects or blemishes caused during manufacture. No riveting or springs shall be visible after installation. The reflector inner surface shall have an anodic coating of not less than four mils thick. The inner surface shall be free of water spotting and shall maintain a reflectivity ratio of not less than 83 % on clear specular finish. The reflector shall have a low iridescent finish free from multiple colors seen from normal viewing angles.
   2. Luminaries provided with tri-phosphor type lamps shall be provided with low iridescence aluminum reflectors to eliminate discoloration on aluminum reflectors.
   3. The reflecting surface of the cone shall be tested for proper sealing per ASTM B136-63T.

C. Painted Reflectors:
   1. Painted reflectors shall be formed before application of primer and paint. Finish process for reflectors and reflector cones for luminaries with baked white enamel finish shall meet the following requirements.
      a. After 100 hours of exposure to fade-o-meter, reflectance shall be not less than 85%, and finish shall show no visible color change.
      b. After 100 hours of exposure to 100% humidity at 100 degrees F, finish shall show no blistering or other degraded effects.

c. After 150 hours of exposure to salt spray (20% sodium chloride) shall cause not breakdown of film.

2.04 LENSES

A. Lenses, louvers and other light diffusing components shall be contained in frames. Components shall be removable but positively held within the frames so that hinging or other motion of the frame will not cause the diffusing component to drop out. This safety device shall be detachable if necessary and shall not interfere with the fixture performance, maintenance, or the seating of any fixture element, and shall not be visible during normal fixture operation.

B. Fresnel:
   1. Lens shall have uniform brightness throughout the entire visible area at angles from 45 degrees to 90 degrees from vertical, without bright spots or striations.
   2. Lens shall have opaque risers - color as specified in schedule.
   3. Finish of visible regress surface of door shall be matte baked enamel paint - color as specified in schedule.

C. Glass:
   1. Flat glass lenses shall be heat tempered borosilicate glass unless otherwise noted.
   2. Provide clear glass safety lens in metal halide fixtures unless noted otherwise.
      a. Glass finish (i.e. sandblasting, etching, polishing) shall be as scheduled.

D. Acrylic:
   1. Lenses shall be of injection molded crystal clear 100% virgin acrylic, .125 thickness.
      a. For lenses with female pattern, specified thickness refers to overall thickness of material. (Example: A12.125 lens refers to a .125 nominal thickness)
      b. For lenses with male pattern of pyramids (cones), specified minimum thickness refers to distance from flat surface to base of pyramids (cones), or thickness of undisturbed material. (Example: A19 lens)
   2. Lenses shall fully eliminate lamp images when viewed from all directions within the 45-degree to 90-degree angle from vertical when the ratio of lamp spacing to the distance from lamp underside to top of lens does not exceed 1.5. Within the viewing angle from 0 to 45 degrees, the ratio of maximum brightness (under a lamp) to minimum brightness (between lamps) shall not exceed 3 to 1.
   3. Lenses shall produce a VCP or at least 65 based on a 30 x 30 room with 80/50/20 reflectances lit to 100 footcandles (verified by and independent laboratory.)
   4. Lenses shall produce no more than 585 footlamberts of brightness in the critical 65-degree zone.
   5. Finishes (i.e., sandblasting, etching, polishing) shall be as scheduled.

2.05 PARABOLIC AND FLAT BLADE LOUVERS

A. Louvers shall be continuously bound in channel formed frame, finish and color as scheduled.

B. Louver shall provide a minimum visual cut-off to the lamp of 45 degrees.

C. The finish of the visible surface of the reflector shall be highly specular as described above for the Alzak process.

D. For flat blade louvers, blade thickness shall be a minimum of .125" flat steel.

2.06 BALLASTS

A. FLUORESCENT
1. Unless indicated otherwise on fixture schedule, linear fluorescent lamp ballasts shall be Instant Start
2. Provide 2, 3 or 4-lamp ballasts as required for the number of lamps in each fixture unless indicated otherwise on drawings. Where dual switching of multiple lamp fixtures is shown on drawings to provide variable light intensities, provide multiple ballasts per fixture as required to accomplish the switching arrangement shown.
3. Acceptable Manufacturers
   a. Instant Start
      1) 20% THD-T8 lamps: Advance REL series (120V), VEL series (277V) or equivalent by Magnetek, Motorola, Osram/Sylvania.
      2) 10% THD-T5/T8 lamps: Advance RCN series (120V), VCN series (277V) or ICN series (dual 120/277V) or equivalent by Magnetek, Motorola, Osram/Sylvania
   b. Programmed Start -
      1) Advance Mark V (2F32T8) RIC-2S32
      2) Advance Centium (2F28T5) RCN-2S28 or equivalent by Magnetek, Motorola, Osram/Sylvania
   c. Rapid Start - 20% THD-T8, T8/HO lamps: Advance GEL series or equivalent by Magnetek, Motorola, Osram/Sylvania
      1) 10% THD-T8 lamps: Advance GCN series or equivalent by Magnetek, Motorola, Osram/Sylvania
   d. Program Rapid Start -
      1) 10% THD-T8 lamps: Advance RCN series (120V), VCN series (277V) or equivalent by Magnetek, Motorola, Osram/Sylvania
   e. Programmed Start Dimming -
      1) (0-10 volt dimming) Advance Mark VII series, Motorola Helios, Lutron Eco-10
      2) (Line Voltage dimming) Advance Mark X series, Lutron Hi-Lume
4. Ballasts shall be high frequency electronic type, and shall operate lamps above 42 kHZ to avoid interference with infrared devices.
5. Ballasts shall operate from 60 Hz input source of 120 or 277 volts and be capable of withstanding sustained variations of +/- 10% in voltage and frequency without damage to ballasts. Ballasts shall tolerate sustained open circuit and short circuit output conditions without damage. Ballasts shall provide transient immunity as recommended by ANSI C62.41.
6. Ballasts shall comply with ANSI C82.11; FCC Part 18 Non-Consumer Equipment, Class A for EMI;
7. Ballasts shall have a Class A+ sound rating.
8. Input current Total Harmonic Distortion (THD) shall not exceed 10% for non-dim primary lamp applications, and 10% for dimming applications.

9. Ballasts shall operate lamps with no visible flicker (<3% flicker index).
10. Minimum ambient temperature for lamp start shall be 0 degrees F.
11. Lamp Current Crest factor shall be 1.7 or less in accordance with lamp manufacturer recommendation for non-dim applications, and 1.6 or less for dimming applications.
12. T8 and T5 Ballasts shall have a Power Factor of .98 or greater for primary lamp applications. Dimming ballasts shall have a Power Factor of .98 or greater at full light output and greater than .90 throughout the dimming range. Compact fluorescent ballasts shall have a Power Factor of .96 or greater.
13. Ballasts shall have a minimum Ballast Factor for primary lamp applications per ANSI C82.11 as listed below:
    a. T8 normal light output: 0.85
    b. T8 low wattage: 0.75
    c. T8 High light output: 1.2
    d. T5 and T5HO: 1.00
    e. Dimming Ballasts with 0-10Volt control: range 0.88-0.05 (100% to 5% relative light output)
    f. Dimming Ballasts with powerline control: range 1.0-0.05 (100% to 5% relative light output)
    g. T4 and T5 Compact fluorescent 13W- 42W: 0.93
14. Compact fluorescent, T5 and T5HO ballasts shall incorporate lamp shutdown circuitry for end of lamp life protection. Ballasts shall allow for relamping without the need to cycle power.
15. Ballasts in exterior fixtures shall be UL935 listed, Class P, Type 1 Outdoor rated.

B. HID
1. CWA
    a. Ballasts shall be designed in accordance with all applicable ANSI specifications including C82.4. Ballasts shall be manufactured in an ISO 9002 and ISO 14001 certified facility.
    b. Core & Coil ballasts shall be designed with class "H" (180 degree) or higher insulation system and vacuum-pressure impregnated with a silica-filled polyester resin.
    c. Core & Coil ballasts shall be designed to operate for 60,000 hours of continuous operation at their maximum rated temperature.
    d. Core & Coil ballast and starter combinations shall be designed to provide a reliable lamp starting down to -40 degrees C for high pressure sodium, and -30 degrees C for metal halide at nominal line voltage +/- 10%.
    e. Ballasts shall have a nominal ballast factor of 1.0.
    f. Ballasts shall completely enclose all live parts.
    g. Ballast igniters shall be designed to provide six months of lamp open circuit operation without failure.
    h. Ballast igniters shall be designed to withstand 10,000 hours of continuous pulsing.
2. Electronic (Pulse Start)
    a. Lamp Current Crest Factor shall be 1.5 or less in accordance with lamp manufacturer recommendation.
    b. Ballast shall tolerate operation of up to 85 degrees C case temperature without damage.
    c. Ballast shall have a nominal ballast factor of 1.0.

d. Input current THD shall not exceed 15% for the primary lamp.
e. Ballasts shall have a power factor greater than .90.
f. Ballast shall have a Class A sound rating. Ballast shall be acoustically isolated from housing using mounting pads to minimize vibration and noise level.
g. Ballast shall be thermally protected and incorporate lamp shutdown circuitry for end of lamp life protection.
h. Ballast shall operate in ambient temperatures as low as -20 degrees F.
i. Ballast shall operate lamps at a frequency of less than 200 Hz to minimize acoustic resonance inside the lamp arc tube and to minimize lamp flicker.
j. Ballast shall be manufactured in an ISO 9002 certified facility.

2.07 FIXTURE WIRING

A. Voltage rating for conductors shall be 300 volts minimum for fixtures designed to operate at 120 Volts or less, and shall be 600 volts minimum for fixtures designed to operate above 120 volts.

B. Wiring shall be code-approved for fixture wiring, and shall comply with the minimum temperature ratings mandated by recognized testing agency.

C. Flexible cord wiring between fixture components or to electrical receptacle, which is not enclosed in wireway, shall have a minimum temperature rating of 105 degrees C. Cord shall be suitable for the application and shall be fitted with proper strain relief and watertight entries where required by the application.

D. Splices within fixtures shall be made within separate splice compartments, and shall utilize nylon insulated crimped connections or quick disconnect devices. Splices to branch circuit shall be made using flame retardant thermoplastic wire nuts with fully seated helical metal spring and threaded entry.

2.08 LAMPS

A. Lamps shall be as indicated on the lighting fixture schedule. Except as specified otherwise, lamps shall be of the same manufacturer throughout the project.

B. A complete set of new lamps shall be provided for each fixture in the project. Where fixtures are installed and utilized for testing before substantial completion, the required set of new lamps shall be installed no earlier than one month before scheduled substantial completion. Contractor shall provide lamps for use if fixtures must be utilized earlier in the project.

C. Fluorescent lamps shall be as manufactured by Philips, Osram/Sylvania or GE. Provide the same lamp color and CRI as indicated below throughout the project except as scheduled otherwise:
1. 3500 degree K, 75 CRI or greater

D. Incandescent Lamps shall be 130 volt rated (Extended / Rough service) operated at 120 volt where available.

E. Metal halide lamps for indoor applications shall include:
   1. Coated type with CRI of 70 or greater with color shift not to exceed +/- 400 degrees K for mogul base, or +/- 200 degrees K for medium base (Equal to GE, Philips, Osram, Venture)
   2. Stabilized color, coated with CRI greater than 80 (Equal to GE ConstantColor, Philips MasterColor

F. Provide pulse start lamps for pulse start fixture types.

G. Metal Halide lamps for outdoor applications shall be clear.

2.09 EMERGENCY TRANSFER AND BATTERY PACKS

A. Emergency lighting shall be provided with an emergency ballast. Ballast shall delay AC ballast operation for five seconds to prevent false tripping of AC ballast end-of-life shutdown circuits. Emergency ballast shall consist of a high-temperature, maintenance-free nickel-cadmium battery, charger and electronic circuitry contained in one galvanized steel case.

B. A solid state charging indicator light to monitor the charger and battery, a single-pole test switch, and installation hardware shall be provided, and shall be completely assembled in the luminaire.

C. Where emergency fixtures are installed in locations inaccessible from a 15-foot ladder, the test switch shall be installed remotely in location as determined by the Architect or as indicated on drawings.

D. The emergency ballast shall be capable of providing the lumen output as indicated below. Acceptable manufacturer: Bodine, Iota Engineering, Side-Lite, DualLite. (Bodine model numbers are listed for quality standards.)
   1. 450 total lumens for straight lamps : Bodine B100 (Code Compliant minimum)
   2. 600 total lumens for straight lamps : Bodine B90
   3. 700 total lumens for straight lamps : Bodine B60
   4. 1350 total Lumens for straight lamps: Bodine B50 (High lumen output)
   5. 3500 total lumens for straight lamps or 4-pin compact fluorescent: Bodine B30 (Full lumen output)
   6. 950 Lumens for 2 pin compact fluorescent: Bodine B426 (High lumen output)
   7. 1050 Lumens for use with dimming ballasts: Bodine B84C (High lumen output)

E. The emergency ballast shall be capable of providing the lumen output as indicated below. Acceptable manufacturer: Bodine, Iota Engineering, Side-Lite, DualLite. (Bodine model numbers are listed for quality standards.)
   1. Provide 100% full light output (3500 total lumens) for straight lamps in designated operating room fixtures. Provide a single wall-mounted test switch, Bodine KTS-PL, which will simultaneously test multiple battery units.

F. Where Emergency lighting is connected to a generator, but where time delay for lamp restart is not acceptable, provide short duration battery packs for indicated fixtures which

will provide continuous light output until generator start-up and transfer is completed. Battery pack shall be capable of providing the lumen output as indicated below.

1. 3200 lumens for a single straight or long compact fluorescent lamp: Bodine GEN1
2. 7900 total lumens for multiple straight or long compact fluorescent lamps: Bodine GEN3.

G. Where Emergency lighting is connected to a generator, but must also be controlled locally, provide a transfer device for each fixture, which will bypass the local control upon loss of normal power source. Device shall be mounted within the associated fixture and shall be warranted by the manufacturer for five years. Unit shall be UL listed as a transfer device, equivalent to Bodine GTD or approved equal.

2.10 ATTIC STOCK

A. Provide one case of each lamp type utilized in the project and turn over to owner at project completion.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Scheduling of fixture installation shall be coordinated with other trades such that the fixtures will be protected from construction and dirt/water/debris damage. Fixtures, which are damaged, shall be replaced at no cost to the owner.

B. Fixtures shall be securely mounted as required by NEC and manufacturer recommendation.

C. Coordinate with ceiling system contractor for the installation of ceiling support wires at two opposing corners of recessed troffer fixtures.

D. Support fixtures in seismic zones as detailed on drawings.

E. Fixtures shall be located and installed as shown on architectural reflected ceiling plans. Coordinate with other trades to allow fixture locations to clear diffusers, ductwork and piping.

F. Coordinate final locations and mounting heights of fixtures within mechanical and electrical rooms with units, duct, conduit, and cable tray routings for optimal performance of specified fixtures. Maintain access for servicing of luminaire components.

G. Determine type of ceiling to be installed in each space from architectural drawings and schedules and furnish fixtures suitable for the exact ceiling type.

H. Receive, store, uncrate, install and lamp fixtures shown in schedule on drawings or indicated to be furnished by others.

I. Recessed fixtures in dropped ceiling areas shall be connected using flexible conduit. Conduit shall be connected to fixture and outlet box. Each piece shall have a separate insulated green grounding conductor not smaller than No. 14 for grounding continuity

between fixture and conduit system. Grounding conductor shall be mechanically connected in a permanent and effective manner to fixture and conduit system and be electrically continuous. No conduit shall enter a recessed fixture directly as this method prevents removal of fixture without disturbing balance of circuit.

J. Recessed fixtures installed in exposed or concealed tee bar ceilings may used ceiling grid to support fixtures. Fixtures shall be securely fastened to ceiling framework using approved clips per NEC.

K. Recessed and surface fixtures in or on concealed Z-spline ceilings shall be supported from the building structure.

L. Recessed and surface fixtures in or on plastered or drywall ceilings shall be supported from support channel spanning across main support channels and shall not depend on ceilings for support. Fixtures in plastered or dryvit ceilings shall have plaster frames.

M. Maintain integrity of enclosures on enclosed and gasketed fixtures. Minimize number of enclosure penetrations and make such penetrations water and dust tight with appropriate gasketing and fittings.

N. Where fixtures are served from multiple circuits (i.e. normal and night/emergency operation or large loads which are dual level switched), each branch circuits shall be provided with a separate neutral conductor back to the associated panelboard.

O. Provide fire-rated enclosures around recessed luminaries, which are installed in fire, rated ceiling assemblies.

P. Coordinate length of continuous-run fluorescent fixtures with actual cove, wall, coffer, partition dimensions.

Q. Replace noisy ballasts as directed by the Architect.

R. Parabolic luminaries shall be installed with Mylar cover over louvers. Cover shall be UL listed for temporary lighting. Upon completion or work, remove Mylar cover with white gloves.

S. Upon final building cleaning, clean the lenses, baffles, louvers, reflector cones and bottoms of the trims of all lighting fixtures. Use soft, non-abrasive cloth and a cleaning solution as recommended by the fixture manufacturer. Luminaire components whose finishes are damages shall be replaces at no cost to the Owner.

3.02 AIMING AND ADJUSTMENTS

A. Adjustable fixtures shall be adjusted by the Contractor to illuminate intended area to the satisfaction of the Owner. Labor, equipment and other materials necessary to perform aiming shall be provided as needed.

B. Exterior adjustable fixtures shall be adjusted at night by the Contractor to illuminate intended area to the satisfaction of the Owner. Labor, equipment and other materials necessary to perform aiming shall be provided as needed.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 26 05 00.

B. Provide labor, materials, equipment and fixtures for exterior lighting, including, lamps, poles and pole bases, for:
   1. Parking lot and access roads
   2. Exterior signage
   3. Walkways and exterior building lights

C. Refer to details and arrangements shown on drawings.

D. Concrete bases will be installed under other Divisions. Coordinate proper size of bases, anchor bolts and conduit stub-ups.

E. Where seismic conditions exist, provide concrete bases as indicated in the detail on drawings.

F. Fixtures and poles shall be suitable for exterior use, shall be UL listed, and shall be a standard design for exterior application.

1.02 RELATED SECTIONS

A. Section 26 51 13: Interior Lighting Fixtures, Lamps, and Ballasts

B. Division 03: Concrete

C. Division 09: Painting

1.03 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are those shown in lighting fixture schedule on drawings.

B. For contactors: Square "D", General Electric, Allen-Bradley, Cutler Hammer.

C. For Photo Cells: Tork, model no. 2101.

2.02 MATERIALS

A. Luminaries, including all components, shall be designed to meet extreme temperature (low), moisture, and wind conditions in area of project.

B. Poles: Steel, round or square, designed for 100 MPH constant velocity wind load.
   1. Include base template, 4 anchor bolts, cadmium plated hardware and pole grounding lug, handhole, cast steel anchor base and bolt covers.
   2. Finish: Factory primed, supplier to furnish sufficient paint for adequate field painting of two coats. Application of paint shall be accomplished under Division 09.

C. Ballast shall be UL listed high power factor, designed for -20 F starting.

D. Diffusers shall be 100 percent virgin acrylic Plexiglas. Hardware and fasteners shall be corrosion resistant.

E. Pole wiring from base to ballast shall be No. 12 with fuse protection by a 30 A, 600 volt Tron waterproof fuseholder, Bussmann "Limitron" fuse, size rating 3 times load current.

F. Contactors: Mechanically held type, main contacts rated for 480 volts and ampacity required, 120 volt operating coil, designed for tungsten, fluorescent, metal halide, high pressure sodium or mercury lamp loads.
   1. Provide NEMA 1 enclosure
   2. Square D, Class 8903

G. Photo Cells shall be 120 volt, enclosed, weatherproof type for outdoor application.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install photo cells above roof with cells facing north.

END OF SECTION

PROJECT MANUAL

TENNESSEE STATE UNIVERSITY
FOOTBALL PRACTICE FACILITY

PREPARED FOR:
OWNER

TENNESSEE BOARD of REGENTS
OFFICE of FACILITIES DEVELOPMENT
NASHVILLE, TENNESSEE 37217-2833

SBC Project No. 166/001-03-2007

PREPARED BY:
DESIGNER

MOODY•NOLAN INC.
ARCHITECTS • ENGINEERS • PLANNERS
1625 BROADWAY, 4TH FLOOR

NASHVILLE, TENNESSEE 37203
615-386-9690 FAX 615-386-0528

CONSULTING ENGINEERS:

LITTLEJOHN ENGINEERING ASSOCIATES
CIVIL ENGINEERING

EMC STRUCTURAL ENGINEERS, P.C.
STRUCTURAL ENGINEERING

SMITH SECKMAN REID, INC
MECHANICAL AND ELECTRICAL ENGINEERING

CONSTRUCTION DOCUMENTS
November 19, 2009