

PROJECT MANUAL

COVER PAGE

U.S. DEPARTMENT OF ENERGY SOLAR DECATHLON 2013

TEAM TEXAS



ADAPT HOME

UNIVERSITY OF TEXAS AT EL PASO & EL PASO COMMUNITY COLLEGE



Primary Contact:

Austin Marshall, J.D. , P.E

Professor

UTEP

Civil Engineering

Engineering Building, Room A-214

asmarshall@utep.edu

(915) 747-5765

Construction Documentation Phase Project Manual

Re-Submission

August 20, 2013



CONTENTS

Cover Page..... 1
ADAPT HOME..... 1

Contents 2

Summary of Changes..... 4
[04/05/13] construction documentation phase project manual RE-SUBMISSION (doe review and comments) .4
[02/14/13] construction documentation phase project manual (doe review and comments) 7
[11/20/12] Revision- design Development project MANUAL (doe review and comments) 8

Rules Compliance Checklist 8

Structural Calculations 12

Detailed Water Budget..... 13

Summary of Unlisted Electrical Components 14

Summary of Reconfigurable Features 15

Summary of Engineering Design 16

Interconnection Application Form..... 17

Energy Analysis Results and Discussion 18

1.1 Energy analysis 1 18

Quantity Takeoff of Competition Prototype House 21

Construction Specifications 26
 Division 01 - General Requirements 26
 Division 05 – Metals..... 36
 Division 06 – Wood, Plastics, and Composites 41
 Division 07 – Thermal and Moisture Protection..... 66
 Division 08 – Openings 79
 Division 09 – Finishes 88



Division 10 – Specialties 109

Division 11 – Equipment 129

Division 12 – Furnishings..... 133

Division 13 – Special Construction 138

Division 14 – Conveying Equipment 139

Division 21 – Fire Suppression 139

Division 22 – Plumbing 156

Division 23 – Heating, Ventilating, and Air-Conditioning (HVAC) 238

Division 25 – Integrated Automation 271

Division 26 – Electrical 271

Division 45 – Industry-Specific Manufacturing Equipment 322

Division 48 – Electrical Power Generation..... 322

APPENDIX A- STRUCTURAL CALCULATIONS 323

APPENDIX B- ICC-ES EVALUATION 325

APPENDIX C- PRODUCT DATA 326

Electrical Information 326

Mechanical Information 327

Plumbing Information 328

APPENDIX D- TRANSPORTATION INFO 329



SUMMARY OF CHANGES

Significant changes to the project manual that have occurred between submissions have been outlined below. The Construction Drawings should also be reviewed for relevant revisions.

[04/05/13] CONSTRUCTION DOCUMENTATION PHASE PROJECT MANUAL RE-SUBMISSION (DOE REVIEW AND COMMENTS)

The Project Manual has been updated from the previous issue. Revisions include:

- Revision 1- Summary of changes
- Revision 2- Rules of Compliance Checklist
- Revision 3- Structural Calculations and ICC-ES EVALUATION
- Revision 4- Detailed Water budget
- Revision 5- Summary of unlisted Electrical Components
- Revision 6- Summary of reconfigurable Features
- Revision 7- Interconnection Application Form
- Revision 6- Energy Analysis results and Discussions
- Revision 8-Quantity Takeoff of competition Prototype ADAPT home
- Revision 9- Specifications
- Construction Documents:

G- General

G-001 Table of comments
Updated table of contents

G-102 EGREES PLAN
Updated information

G-003 ADA Tour Route Compliance Plan
Sheet Added

C- Civil

C-103 Site Utility Plan
Added notes clarifying handrail details

L- Landscape

L-101 Landscape and Planting Site Plan
Added North arrow

L-102 Landscape Irrigation and Greywater plan
Added coordinates and north arrow

L-103 Landscape Irrigation Notes and Details
Sheet added

S- Structural

S-001 General Structural Notes

A lateral narrative has been included here. To further understand the lateral force resisting system, review pages 18-25 of the structural calculations.

S-101 Foundation Plan

New perimeter piers were added in order to extend the also new foundation North-South W8x13 beams. The foundation for the main ramp entrance was removed since an independent fabricator will manufacture the ramp. This ramp will be independent of the deck structure. Furthermore, the interior pier footing was enlarged to account for the 2' needed between each steel stake. The wedge anchors are appropriate for the design. Please review pages 51, 53, 54, A5, and A6 of the structural calculations. Also, the steel stake analysis has been provided as well. Please review pages 51, 53, and 54 of the structural calculations.

S-102 Floor Framing Plan

The floor system will now consist of a panelized 2x10s timber framing system. The mechanical room floor framing system was added as well. The deck will generally remain the same with the exception of an addition to place a planter directly North of the mechanical room. The main entrance ramp was completely removed. Please note that R-Control SIPs will no longer be part of our design. ICS-Rocky Mountain SIPs will manufacture the new wall and roof SIP system. A lateral analysis for the deck has been provided in page 57 of the structural calculations.

S-103 Roof Framing Plan

The whole exterior canopy system was added.

S-501 Details

Newly designed foundation beams' connection was added. The new floor framing system connections were added as well.

S-521 Deck Details

This completely new structural plan shows the deck details and a canopy footing.

S-531 Roof Details

This completely new structural plan shows the roof details including the canopy.

A-Architectural

A-001 Architectural Symbols and Notes

Wall legend / C: modified detail, not included on revision notes

A-101 Architectural Site Plan

B3, A3, D2, C2/A-101 notes added, not included on revision notes

A-111 First Floor Plan

A1/A-111 added information for the mechanical room door, revision note has been addressed at door schedule

A-112 Roof Plan

Added section symbols and notes



A-211 Elevations

Added handrail notes to D2 and B2

A-212 Elevations

Added handrail notes to D2 and B2

A-213 Interior Elevations

Added note to D1/A-213

A-301 Building Section

Changed drawing Title

A-302 Building Sections

Changed drawing title, modified sections to reflect changes in structural design

A-311 Building Sections

Added notes.

A-312 Wall Sections

Modified section to reflect changes in structural design, added notes.

A-401 Large Scale Plans

Deleted sheet

A-531 Window Details

New sheet, added window details

A-601 Schedules

Update information on doors and windows

P- Plumbing

P-100 Plumbing Site Plan and Keyed notes

Tank locations were identified on drawings.

P-300 Plumbing Solar System

Temperature and pressure valves were added to the schematic drawing.
Heat exchange no longer applies as the design has been changed.

P-400 Plumbing Fixture Schedules

Drawings will be labeled and made to be in the correct order as they are listed.

M- Mechanical

M-200 Enlarged Mechanical Room Floor Plan

Maximum temperature issue has been addressed as the system will not have temperatures exceeding the 180F limit and is fitted with pressure relief valves.
Organizer Enclosure has been shown on the plan and elevation views.

M-300 Mechanical Schematics

Comments no longer apply as the design has changed and all equipment specs are listed in the manufacturer's documents.



E- Electrical

E-100 Electrical Site Plan and Electrical Power

Inverter and combiner locations have been added to the drawings.

The inverter and combiner box location have been labeled in the Electrical Keyed Notes, numbers 8 and 11.

E-300 Electrical Power Floor Plan, Appliance Schedule, Modular Wiring System Diagram

All outlets have been labeled GFCI and AFCI as well as weather resistant where necessary as per NEC codes. Tamper resistant receptacles are referenced in the Electrical General Notes, 2D, and have been labeled accordingly.

E-500 Electrical Three Line Diagram

Information on drawings reflects the most recent information in the Project Manual.

Electrical specs have been updated and are reflected throughout the key notes.

String compliance for PV panels with the inverter and combiner have been checked and calculations are shown on the drawing.

Conductor and conduit sizes have been listed on the drawings.

Issues with the Peltier system no longer apply as the design has been changed. Sunpower inverter listed in specs (Electrical keyed notes): Division 48 in Project Manual

Make and model with specifications has been reference on E500 in the PV System Components Section.

We have provided a PV String Calculation on E500.

Our panel selection has changed since last submittal, the new Prism Solar panels are UL listed, see project manual.

Grounding and bonding details are under Electrical Keyed Notes number 17.

O-Operations

Project manual comment on transportation was responded with the phases from sheets O-101 and O-102 listed.

Safety Manual included all aspects for the crane and rigger requirements except for rigger and spreader bar selection and structural calculations.

O-101 Arrival Sequence plan

Plan for crane boom length was responded with the addition of two sheets O-103 and O-104 which position the crane to more appropriate locations with a feasible boom length.



The Project Manual has been updated from the previous issue. Revisions include:

- Revision 1- Summary of changes
- Revision 2- Rules of Compliance Checklist
- Revision 3- Structural Calculations and ICC-ES EVALUATION
- Revision 4- Detailed Water budget
- Revision 5- Summary of unlisted Electrical Components
- Revision 6- Summary of reconfigurable Features
- Revision 7- Interconnection Application Form
- Revision 6- Energy Analysis results and Discussions
- Revision 8-Quantity Takeoff of competition Prototype ADAPT home
- Revision 9- Specifications

[11/20/12] REVISION- DESIGN DEVELOPMENT PROJECT MANUAL (DOE REVIEW AND COMMENTS)

The Project Manual has been updated from the previous issue. Revisions include:

- Revision 1- Summary of changes
- Revision 2- Rules of Compliance Checklist
- Revision 3- Structural Calculations and ICC-ES EVALUATION
- Revision 4- Detailed Water budget
- Revision 5- Summary of unlisted Electrical Components
- Revision 6- Summary of reconfigurable Features
- Revision 7- Interconnection Application Form
- Revision 6- Energy Analysis results and Discussions
- Revision 8-Quantity Takeoff of competition Prototype ADAPT home
- Revision 9- Specifications

RULES COMPLIANCE CHECKLIST

RULE	RULE DESCRIPTION	LOCATION DESCRIPTION	LOCATION
------	------------------	----------------------	----------



Rule 4-2	Construction Equipment	Drawing(s) showing the assembly and disassembly sequences and the movement of heavy machinery on the competition site	O-101 O-102
Rule 4-2	Construction Equipment	Specifications for heavy machinery	SECTION 01 54 19
Rule 4-3	Ground Penetration	Drawing(s) showing the locations and depths of all ground penetrations on the competition site	S-101
Rule 4-4	Impact within the Solar Envelope	Drawing(s) showing the location, contact area, and bearing pressure of every component resting directly within the solar envelope	S-101 A-101
Rule 4-5	Generators	Specifications for generators (including sound rating)	N/A
Rule 4-6	Spill Containment	Drawing(s) showing the locations of all equipment, containers, and pipes that will contain liquids at any point during the event	
Rule 4-6	Spill Containment	Specifications for all equipment, containers, and pipes that will contain fluids at any point during the event	SECTION 22 11 16 SECTION 22 11 16 SECTION 22 11 19 SECTION 23 21 13
Rule 4-7	Lot Conditions	Calculations showing that the structural design remains compliant even if 18 in. (45.7 cm) of vertical elevation change exists	STRUCTURAL CALCULATIONS APPENDIX A & B
Rule 4-7	Lot Conditions	Drawing(s) showing shimming methods and materials to be used if 18 in. (45.7 cm) of vertical elevation change exists on the lot	A-101
Rule 5-2	Solar Envelope Dimensions	Drawing(s) showing the location of all house and site components relative to the solar envelope	A-101
Rule 5-2	Solar Envelope Dimensions	List of solar envelope exemption requests accompanied by justifications and drawing references	C-103
Rule 6-1	Structural Design Approval	List of, or marking on, all drawing and project manual sheets that will be stamped by the qualified, licensed design professional in the stamped structural submission; the stamped submission shall consist entirely of sheets that also appear in the drawings and project manual	Appendix A
Rule 6-2	Finished Square Footage	Drawing(s) showing all information needed by the rules officials to measure the finished square footage electronically	G-102



Rule 6-2	Finished Square Footage	Drawing(s) showing all movable components that may increase the finished square footage if operated during contest week	C-103
Rule 6-3	Entrance and Exit Routes	Drawing(s) showing the accessible public tour route	G-101
Rule 7-1	Placement	Drawing(s) showing the location of all vegetation and, if applicable, the movement of vegetation designed as part of an integrated mobile system	L-101 L-102
Rule 7-2	Watering Restrictions	Drawing(s) showing the layout and operation of greywater irrigation systems	
Rule 8-1	PV Technology Limitations	Specifications for photovoltaic components	SECTION 48 19 16 SECTION 26 31 00
Rule 8-3	Batteries	Drawing(s) showing the location(s) and quantity of all primary and secondary batteries and stand-alone, PV-powered devices	
Rule 8-3	Batteries	Specifications for all primary and secondary batteries and stand-alone, PV-powered devices	SECTION 26 05 19 SECTION 26 05 SECTION 33.16 SECTION 26 24 16 SECTION 26 28 00
Rule 8-4	Desiccant Systems	Drawing(s) describing the operation of the desiccant system	N/A
Rule 8-4	Desiccant Systems	Specifications for desiccant system components	N/A
Rule 8-5	Village Grid	Completed interconnection application form	Project manual- Page 15
Rule 8-5	Village Grid	Drawing(s) showing the locations of the photovoltaics, inverter(s), terminal box, meter housing, service equipment, and grounding means	
Rule 8-5	Village Grid	Specifications for the photovoltaics, inverter(s), terminal box, meter housing, service equipment, and grounding means	SECTION 26 05 19 SECTION 26 05 33.16 SECTION 26 24 16 SECTION 26 28 00
Rule 8-5	Village Grid	One-line electrical diagram	
Rule 8-5	Village Grid	Calculation of service/feeder net computed load per NEC 220	
Rule 8-5	Village Grid	Site plan showing the house, decks, ramps, tour paths, and terminal box	C-103



Rule 8-5	Village Grid	Elevation(s) showing the meter housing, main utility disconnect, and other service equipment	E-100
Rule 9-1	Container Locations	Drawing(s) showing the location of all liquid containers relative to the finished square footage	P-100
Rule 9-1	Container Locations	Drawing(s) demonstrating that the primary supply water tank(s) is fully shaded from direct solar radiation between 9 a.m. and 5 p.m. PDT or between 8 a.m. and 4 p.m. solar time on October 1	P-100
Rule 9-2	Team-Provided Liquids	Quantity, specifications , and delivery date(s) of all team-provided liquids for irrigation, thermal mass, hydronic system pressure testing, and thermodynamic system operation	PROJECT MANUAL PAG 11
Rule 9-3	Greywater Reuse	Drawing(s) showing the layout and operation of greywater reuse systems	P-200
Rule 9-4	Rainwater Collection	Drawing(s) showing the layout and operation of rainwater collection systems	P-100
Rule 9-6	Thermal Mass	Drawing(s) showing the locations of liquid-based thermal mass systems	P-400
Rule 9-6	Thermal Mass	Specifications for components of liquid-based thermal mass systems	P-400
Rule 9-7	Greywater Heat Recovery	Drawing(s) showing the layout and operation of greywater heat recovery systems	P-200
Rule 9-8	Water Delivery	Drawing(s) showing the complete sequence of water delivery and distribution events	P-200, P-300
Rule 9-8	Water Delivery	Specifications for the containers to which water will be delivered	APPENDIX C PLUMBING INFO
Rule 9-9	Water Removal	Drawing(s) showing the complete sequence of water consolidation and removal events	P-200
Rule 9-9	Water Removal	Specifications for the containers from which water will be removed	P-200
Rule 11-4	Public Exhibit	Interior and exterior plans showing entire accessible tour route	G-102



STRUCTURAL CALCULATIONS

STRUCTURAL CALCULATIONS are attached in Appendix A of this document.

ICC-ES EVALUATION – are attached in Appendix B of this document.



DETAILED WATER BUDGET

FUNCTION	WATER USE (GALLONS)	CALCULATIONS		NOTES
		GAL	EVENTS	
Hot Water Draws	240	15	16	Our home will not use water for toilets.
Cooking Water	3.75	0.625	6	Used for vaporizing
Dishwasher	30	6	5	
Clothes Washer	137.6	17.2	8	The clothes washer/dryer will be functional, but not used on a regular bases unless otherwise stated.
Fire Protection	25	25	1	The protection system will be initially filled and inspected, but will not be run without emergency situations.
Testing	40	5	8	
Initial Systems Fill	40	40	1	
Radiant Cooling	6.5	6.5	1	System will be recirculated and reused.
Radiant Heating	6	6	1	System will be recirculated and reused.
Vegetation Water	50	50	1	
Safety Factor	115.775	0	0	
WATER REQUIRED	694.625	gallons		



SUMMARY OF UNLISTED ELECTRICAL COMPONENTS

Provide a summary of unlisted components.

1. **Hydronic system** – This system will be used in both the floor (heating) and the ceiling (cooling). The system will consist of 0.5 – inch copper tubing and will cover the entire square footage area of the home, excluding the outer walls. Preliminary plans involve pipes on 2 foot spacing in as lineal layout as possible. The water heater has a separate solar panel on the roof that is used to heat water and create electricity to further heat the water to above 110 degrees. This is then sent through pipes in the floors to create radiant heat. The system also has a condenser and variable refrigeration system like what's in your fridge that creates chilled water that runs through the ceiling creating cold air that keeps the room at a constant temperature. that's pretty much it.
2. **Prism Solar Panels.** Prism's glass-on-glass modules make brilliant use of the sun by generating up to 30% more energy per watt than traditional modules. See appendix C Electrical Information.
3. **Combiner About OutBack Power Systems.** OutBack Power Systems is a leader in advanced energy conversion technology. Our products include true sine wave inverter/chargers, a maximum power point charge controller, system communication components, as well as breaker panels, breakers, accessories, and assembled systems. See appendix C Electrical Information.



SUMMARY OF RECONFIGURABLE FEATURES

Provide a summary of reconfigurable features.

Demonstration of Reconfigurable Features for Jury Tours

During the course of public and jury tours, team members will demonstrate multiple reconfigurable features of the ADAPT home. Each has been outlined below.

The design of the house counts with three basic spaces: the living-dining-kitchen area, the mechanical-closet-bathroom area and the bedroom with closet area. Also has a wooden deck front covered porch and a private terrace in the back. In the front porch, welcoming the visitors, the house has a Lucca round outdoor table and chairs to enjoy the canopy shades before getting into the house.

The living area is furnished with several elements for the comfort of the visitors: a large Bantam 86" sofa in basket fabric, a Bantam cocktail ottoman in basket fabric, a Samsung 46" slim led TV, a Jehs and Laub lounge side chair, two lamp tables, one Rigby media console, one Nelson Swang leg desk, one Nelson pedestal stool, an sound check area rug, some artwork cambas for the walls, one bridge extension center table, one Cherner side chair, and a center piece.

The dining area has a nice Quovis table for ten people, Chairs from Lucca furniture. The kitchen is a functional space composed by colored formica or laminated cabinets and some nice appliances like Thermador 30" built-in bottom freezer, a hooded Thermador 36" master piece series freedom induction cooktop, a Samsung washer/dryer combo, a Samsung dishwasher energy star, a Thermador microwave oven, a built-in oven and stainless steel shelf's and sink.

These areas also have a Sony blu-ray 3D home theater for the joy of being there. The flooring in these areas is a composition of wood floor.

At the end of the house is the bedroom, a space to relax, furnished with one nice minibed with aluminum and walnut wood headboard, one Sonno Pima firm mattress, two aluminum nightstand minibed size, one Nelson Swang leg desk, one Wasy chair and one custom ADE computer. The floor is also plywood finished.



SUMMARY OF ENGINEERING DESIGN

The structural design of the Adapt house was based on efficiency, adaptability, and construction practicality. The house consists of three main systems, the foundation, the main house structure, and an exterior canopy and deck.

Since the Adapt house will be assembled and operated in more than one site, the most important aspect of the foundation system is its adjustable height. It will consist of two longitudinal and four transverse W12X22 A992 steel beams where the main structure will rest and connect to. Six adjustable piers will support each longitudinal beam. Each pier has an adjustable height from 11 to 18 inches to accommodate for any change in slope at ground level. These piers will rest on a concrete footing, which will be braced to the ground with 2 40-inch long steel stakes to resist wind uplift, and seismic and wind generated overturning and sliding. The building codes used to design the foundation system were the AISC-Steel Construction Manual, ACI 318-08, 2009 IBC, and ASCE 7-10.

Most of the main house structure will be made of structural insulated panels (SIP) with a polyurethane core to provide high-efficiency insulation and a simple and speedy construction. The roof consists of 8 ¼-inch thick panels providing an R-value of 54 and the walls consist of 6 ½-inch panels with an R-value of 42. The walls will rest on an 8-inch deep wooden frame sub-flooring system with polyurethane spray foam for insulation. To take the fullest advantage of the structural properties of these panels, the walls will serve as load-bearing walls as well as the lateral-force-resisting-system for wind and seismic loads. These systems were designed with ASTM-approved technical data provided by the SIP manufacturers and the 2009 IRC.

The exterior space of this home is made up of a floor deck with a partial canopy overhead. The deck material is made up of a high-performance wood-alternative composite material. The framing system for the deck will consist of 8 ¾ inch box beams serving as supporting girders for the joists spanning throughout the whole deck. Wooden 4x4 posts with a 6-inch adjustable base will transfer the deck loads to the ground. Each post will be braced to the ground with 1 40-inch long steel stake to provide the same resistance as the house foundation system. The canopy will consist of 6-inch deep rectangular HSS beams to support perforated sheet metal and 3-inch square HSS supports. The AISC-Steel Construction Manual was used for the canopy design and span tables provided by the manufacturer were used for the deck design.



INTERCONNECTION APPLICATION FORM

Team TEXAS and Lot 106

PV Systems

Module Manufacturer	Short Description of Array	DC Rating of Array (sum of the DC ratings)
Prism Solar Model B245	Highly efficient bifacial modules that collect solar rays from both front and back surfaces. Generate a max of 245w with up to a 30% increase from the back surface, resulting in a maximum of 315w.	(28) 245w panels

Total DC power of all arrays is 8.3 kW (in tenths)

INVERTERS

Inverter Manufacturer	Model Number	Voltage	Rating (kVA or KW)	Quantity
Schneider Electric	CONEXT TX5000NA	600Vdc, 240Vac	5.0 kw	2

Total AC power of all inverters is 10 kw kVA or kW (in whole numbers)

REQUIRED INFORMATION

	Location
One-Line Electrical Schematic	1/E-500
Calculations of service/feeder net computed load and neutral load	E-400



(NEC 220)	
Plan view of the lot showing the house, decks, ramps, tour paths, the service point, and the distribution panel or load center	1/E-100

Provide the Team's "Electrical Engineer" contact in the "Team Officer Contact Info" database on the Yahoo Group as required per Rule 3-2.

ENERGY ANALYSIS RESULTS AND DISCUSSION

Team Texas conducted a thorough energy analysis throughout the design of the ADAPT home using methods including energy load calculations from the individual appliance and lighting in the home.

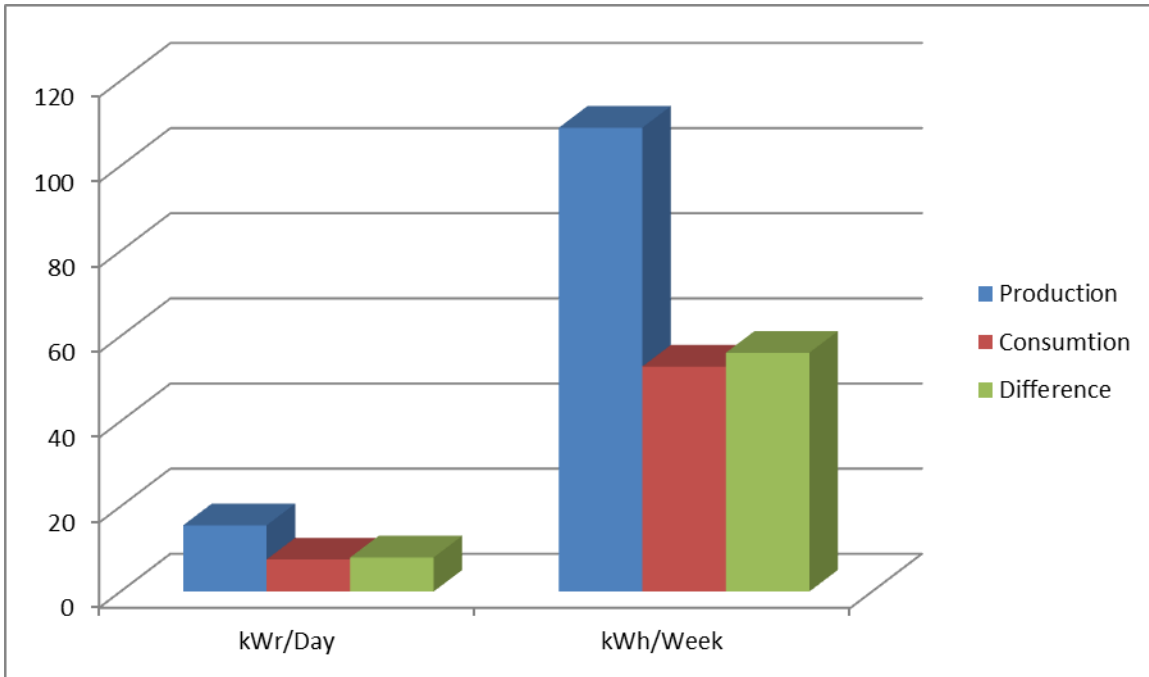
Each study had a significant impact on the design of the home, allowing the Team Texas to create a cost-effective energy-efficient design.

1.1 Energy analysis 1

The photovoltaic system (PV system) will consist of 16 solar panels from the company emCORE, model Soliant 1000. The power that each solar panel array will be producing, given each array contains 8 panels, would be 3.1 kW/hr. With a time period of five production hours a day, the PV system will be able to produce 15.6kW/day and 108.9 kW/wk.

The information obtained from the total average energy consumed by the appliances is the following:

	kW/day	kW/week
Produce	15.570	108.990
Consume	7.554	52.878
Difference	8.016	56.112



(The power analysis does not include the energy consumed by the water heater or the air conditioning system.)

Due to the appliances we have in the house we counter balanced the total wattage needed and concluded that the PV system will produce enough electricity to power the standard appliances. In addition the PV system will produce an extra 10.2 kW/day.

1.2 Annual Electricity Consumption:

End Use	Energy Consumed kWh/year	Total Electricity KW/year
Lighting		
Internal/External	411.574	
		411.574
Appliances		
Washer/Dryer	152.4	
Refrigerator	306.6	
Stove	1402	
Dishwasher	280.3	
TV	0.788	
Computer	78.8	
Microwave/Oven	8.76	
Surround System	2.628	
		2757.21



1.3 Predicted total AC power produced by the photovoltaic system array:

The annual Electricity Production was calculated using the ideal kWh/ day that was provided by the

Rooftop Panels	5683



QUANTITY TAKEOFF OF COMPETITION PROTOTYPE HOUSE

DECATHLON TEXAS TEAM CONSTRUCTION ESTIMATE: The University of Texas at El Paso

SOLAR DECATHLON TEXAS TEAM CONSTRUCTION ESTIMATE: The University of Texas at El Paso				
Specification Number	Brief Description	Detailed Description	Qty	Unit
Division 00				
0	Safety Items	Caution Tape, cones , etc..	1	Lot
Division 01				
1	Professional Engineer FEE	El Paso Firm	1	EA
1	Construction Management FEE	5 % of Total Estimate	1	EA
1	Inspection/Permits Costs	Residential Permit	1	EA
Division 05				
5	Wedge Anchors 5/8" x 12"	Structural Design	48	EA
	W-Beams Transversal	W12 x 22	96	LF
5	W - Beams Longitudinal	W12 x 22	48	LF
5	Ramp railing	2" x 2" Steel Pipe	141	LF
5	shear plates for seismic reasons	1x1x3/16 A36	12	EA
Division 06				
6	Interior Flooring Wood	Pre engineer wood flooring	816	SF
6	Exterior Shade Wall	wood pre-fab shades	340	SF
6	Floor Framing Joists 2x8x10	Commercial Quality	116	EA
6	Floor Framing Double Joists 2x8x14	Commercial Quality	35	EA
6	Wood Base Moldings for doors & base	1/2"x3-7/8"x8' we need 85 door and base moldings	680	LF
6	WOOD BASE MOLDINGS	1/2"x3-7/8"x8' we need 15 base mouldings	115	LF
6	WOODEN DECK	2'x6'x12' woodland brown composite decking	830	SF
6	Wooden deck post and accessories	4"x4" wood post	44	EA
6	Wooden decks studs	2" x 4" wood studs	830	SF
6	Interior wall studs	2" x 4" wood studs	320	SF
Division 07				
7	Roofing SIP Panels	6.5" Standard ICS panel	816	SF
7	Flooring SIP panels	10.25" ICS Panel	816	SF
7	Walls SIP Panels	6.75" ICS Panel	2260	SF
7	FLOOR SEALS	3M 12.8 oz White Polyurethane Specialty Caulk	50	LF
7	WALL SEALS	3M 12.8 oz White Polyurethane Specialty Caulk	60	LF
7	Roofing finish	WB1035 White on Black EPDM 60 mil 10 x 35	768	SF
7	Exterior siding	Corrugated or corten dending on wall	1664	SF
7	Moisture membrane material	Bruce 5/16" Moisture Barrier	3296	SF
7	Sealant tape	Latex-ite Pli-Stix 30 ft. Medium	600	LF
7	Sealant Joint	Latex-ite Pli-Stix 30 ft. Medium	300	SF
7	Plastic Skirting	Advantage Solid Panel(73000)	738	SF



Division 08				
8	Window 1' x 6'8"	Double pan sliding window Model # JVVYL SLD GRID 4030	1	EA
8	Window 6' x 2'	Double pan sliding window Model # JVVYL SLD GRID 4030	1	SF
8	Window 2' x 6'	Double pan sliding window Model # JVVYL SLD GRID 4030	1	EA
8	Window 1' x 6'	Double pan sliding window Model # JVVYL SLD GRID 4030	3	EA
8	Nana Wall Window 2' 3" x 6' 8"	Double sliding nanawall model #SL45	2	EA
8	Nana wall Glass Door double swing 6' x 8'	Double sliding nanawall model #SL45	2	EA
8	Furnishing hardware	Miscellaneous	1	lot
8	Wood door 2'6" x 6'8"	JELD-WEN Santa Fe 30 in. Ponderosa Pine White Right-Hand 2-Panel Prehung Door	6	EA
Division 09				
9	Metal Wall Panels (4'x5')	Aluminum siding	1898	SF
9	DRYWALL	5/8 4' x 8' Item #: 11737 Model #: 5848FXT080000	600	SF
9	TILE (12"x12")	Porcelain tile Item #: 88541 Model #: G3TG20	72	SF
9	SPECIALTY CEILINGS	Ceiling tile panel 2' x 2' metal Trims included Item #: 89091 Model #: 5422235LWH	816	SF
9	INTERIOR PAINTING	15gal. Total. Valspar Ultra Semi Gloss Paint and primer in one. Item #: 391666 Model #: 007.0391666.008	2498	SF
Division 10				
10	Interior Flooring Flat Channel	Aluminum flat channel	816	SF
10	Anchor Pier Manufactured by Central Pier Inc.	Structural Design	12	EA
10	Seismic Pier Manufactured by Central Pier Inc.	Structural Design	12	EA
10	GLASS SHOWER DOORS (3'X6')	Commercial Quality	2	EA
10	Signage	General Information Board	7	EA
10	Plastic to cover exposed sections of modules for transport	Commercial Quality	3120	SF
10	Plastic to cover all sides of modules for transport	Commercial Quality	2700	SF
10	Fire extinguishers	Kidde Pro 340 Fire Extinguisher	1	EA
Division 11				
11	COMPUTER	Custom Made Computer	1	EA
11	OVEN	Thermador 30" masterpiece series steam and convection oven #MES301HS	1	EA
11	Microwave	Samsung #SMH1816S	1	EA
11	REFRIGERATOR	Thermador 30" built-in Bottom freezer #T30BB810SS	1	EA
11	SOUND SYSTEM	Sony #BDV-N890W Blu-ray 3D home theatre	1	EA
11	Cook top	Thermador 36" master piece series freedom induction cooktop #CIT36XKB	1	EA
11	Washer/Dryer	LG #WM3455HS Washer Dryer Combo	1	EA
11	Dishwasher	Samsung #DMT800RHS Energy star 24" quiet	1	EA
11	TV	Samsung #UN46ES8000FXZA 46" slim LED 3D HD smart tv energy star	1	EA



Division 12				
12	Sofa	Bantam 86" sofa in basket fabric 86" L x 33" D x 31.5" H Ivory Walnut #27774DWR	1	EA
12	Ottoman	Bantam Coctail Ottoman in basket fabric 34"W x 34"D x 18.5"H Crimosn Walnut #28342DWR	1	EA
12	Side chair	Jehs and Laub lounge 28"W x 28"D x 29.5"H Neutral #18945DWR	1	EA
12	End Table	Lamp table 23"H x 18"W x 18"D Bewitched #82237-450Thomasville	1	EA
12	Media Cabinet	Rigby Media Console W/base 80.5"W x 17.25"D x 20" H Loft #553212 Crate & Barrel	1	EA
12	Desk	Nelson Swag Leg Desk 39.5"W x 28.5"D Walnut #27683	1	EA
12	Stool	Nelson Pedestal Stool 16"H x 15" Diameter Black/white base #30146	1	EA
12	Area Rug	Sound check - floor modular floorcovering 8'x10'/62% recycled content Orange #flor modular	1	EA
12	Artwork canvas	Artwork canvas	1	EA
12	Tables	Bridge extension table, Large 63"L x 39.5"D x 39"H (Extends to 82.75" one leaf/ 102" both leaves) Walnut # 20390DWR	1	EA
12	Chairs	Cherner Side chair 18.5" W x 21.5"D Walnut #7052DWR	1	EA
12	Center Piece	center Piece	1	EA
12	Towels	White Large	4	EA
12	Soap Container	white	10	EA
12	Bed	Minibed w/wood Headboard H12" x W 62" x D82" aluminum/walnut #32861 DWR	1	EA
12	Night stands	Night stands Min Bedside table w/pedestal base aluminum #25810DWR	1	EA
12	Chair	Wasy chair H 28.75" x W28" x D28"	1	EA
12	Matress	Sonno pima firm matress full H8" x W54" x D75" #7633DWR	1	EA
12	Reversible coveret	Reversible coveret full/queen L102" x W90" #24965DWR	1	EA
12	Percalle sheet	Percalle sheet set full #24162DWR	1	EA
12	Lighting	Brazo floor lamp LED and recyclable aluminum H43" - 50" W26.5" #12953DWR	1	EA
12	Tanle outdoor	Lucca round dining table 47.5" DIA 28.5"H White aluminum frame #5084DWR	1	EA
12	Chair	Lucca dining side chair 24"W x 21"W white mesh polished aluminum #3055DWR	4	EA
12	Table	Quovis standing height table 71"L x 27.5"D Stainless steel #2228DWR	1	EA
12	WALL CABNETS (3'X2'X8') (HxDxW)	Item # 140881 Model# 22A W3630	1	EA
12	WALL CABNETS (3'X2'X6') (HxDxW)	Item # 73466 Model# 22AU1&R	1	EA
12	WALL OVER HEAD CABNETS (2'6"x2'x6') (HxDxW)	Item # 140881 Model# 22A W3630	1	EA
12	WALL OVER HEAD CABNETS (2'6"x2'x3') (HxDxW)	Item # 140881 Model# 22A W3630	1	EA
12	WALL CABNETS (9'x2'x12") (HxDxW)	Item # 140881 Model# 22A W3630	1	EA
12	BATHROOM VANITY (3'X2'X4') (HxDxW)	Item# 159584 Model#20G VSDB48 Excluding Taxes	1	EA
12	BATHROOM VANITY COUNTER TOP (2'X4')	Granite 49"W x 22"D Item #:94204 Model # G121-49. Excluding Taxes	1	SF
12	Exhaust Fan	Item # 10064, Model # QT140LE. Kitchen: Item #: 331970 Model #: GXW6530DXS Excluding Taxes	2	EA
12	KITCHEN SINK	Item #: 315797 Model #: 027-OTH-110-STS . Excluding taxes	1	EA
Division 15				
15	inverter	see plans schedules	1	EA
15	header	see plans schedules	1	EA
15	pv combiner panel	see plans schedules	1	EA
15	parabolic reflector w/ frensol lens	see plans schedules	1	EA
15	Bifacial solar cells	see plans schedules	1	EA
15	manifold system	see plans schedules	1	EA
15	ASTM F877 Piping	Polyethylene Pipe (Chilled)	3	EA
15	B&G Pump	1/6 HP Hydraulic Pump	1	EA



Division 21				
21	Fire sprinklers	Ordinance 787 (California) April 30th, 2011	15	EA
21	Fire unit	Ordinance 787 (California) April 30th, 2011	1	EA
Division 22				
22	2" PVC c40 pipe	NIBCO	48	LF
22	2" PVC c40 90 degree elbow	NIBCO	6	EA
22	2" PVC c40 90 degree Tee	NIBCO	6	EA
22	1/2" pvc c40 pipe	NIBCO	120	LF
22	1/2" pvc c40 90 degree elbow	NIBCO	22	EA
22	1/2" pvc c40 Tee	NIBCO	4	EA
22	1/2" pvc c40 Angle valve	NIBCO	7	EA
22	Shower head/faucet	moen	1	Set
22	Kitchen Faucet	moen	1	Set
22	Vanity Faucet	moen	1	Set
22	solar collector	see plans schedules	1	EA
22	pumping system	see plans schedules	1	EA
22	cinco solar model	see plans schedules	1	EA
22	water heater	see plans schedules	2	EA
22	solar controller panel w/pump	see plans schedules	1	EA
22	wash machine hook up	see plans schedules	1	EA
22	roof vent	see plans schedules	1	EA
25	weather unit	1400 Series 4 Channel Remote	1	EA
Division 26				
26	120V AFCI RECEPTACLE	Integral Receptacle Kit Accessory	4	EA
26	120V GFCI RECEPTACLE	GFCI Receptacle - Ivory	3	EA
26	120V TAMPER RESISTANT RECEPTACLE	Pass & Seymour	9	EA
26	120V WEATHER RESISTANT RECEPTACLE	Leviton	5	EA
26	240V RECEPTACLE	GE	2	EA
26	LED BULB	ECO Smart LED Flood Light Bulb	20	EA
26	Ceiling Fan W/ Light	52" Casa Coronado Oil-Rubbed Bronze Ceiling Fan	4	EA
26	Light	FEIT Dimmable Twist Fluorescent Bulb - Spiral	7	EA
26	Recessed Lighting	Halo 6 in. New Construction Insulation Contact Recessed Housing	4	EA
26	Smoke Detector	Kidde Battery Operated 10-Year Lithium Smoke Alarm	2	EA
26	Switch	Leviton15-Amp Toggle Switch	12	EA
26	3-way Switch	Leviton15-Amp 3-Way Toggle Switch	4	EA



26	Wall Outlets	Pass 7 Seymour 15 Amp Combo Wall Outlet	21	EA
26	Floor Outlets	Raco Round Wood Floor Box	2	EA
26	Breaker Panel	Schneider Pannelboard NQOD	1	EA
26	Romex 14/2 Cable (300 LF Rolls)	Southwire 100 ft. 14-2 Romex NM-B W/G White Cable	6	EA
26	Transition Box	KISAE Pure Sine 1000	1	EA
26	DC Interface Integrated	PowerBright ERP1500-12	1	EA
26	Schneider Inverter	TX 5000 NA with AC Disconnect	1	EA
26	Utility Bi-directional Electric Meter	EKM Metering	1	EA
26	Main Service Panel	Siemens Service Panel	1	EA
26	Rod Grounding Electrode	ERITECH 5/8 in. x 8 ft. Copper Ground Rod	1	EA
26	RFC Meter	McDonnell Miller FS-4 Series General Purpose Liquid Flow Switch	1	EA
26	Light pipes	JESCO LCF-24-R-30ft Colorflex SingleColor Flexible Lighting Tubes LED Rope	1	LOT
26	Fiber optic line	LBL Lighting LED Fiber Optic Cable	300	LF
26	Grounding cable, post	4" x 4" x 20'0" Ponderosa Pine Timbers	1	EA
26	Net metering electrical meter	Gen Tran Remote Metering Kit	1	EA
26	Whispergen Electric Generator	Sterling Engine 1KW production	1	EA
Division 28				
28	energy balance control	EA	1	EA
28	carbon and monoxide detector	EA	2	EA
28	fire alarm	YEAR SERVICE	1	EA
Division 32				
32	Autumn Sage	As per Producer Info	5	LOT
32	Vegetables	As per Producer Info	10	LOT
32	ROSEMARY	As per Producer Info	5	LOT
32	Juniper Sabina	As per Producer Info	5	LOT
32	Mint Artmeisia	As per Producer Info	5	LOT
32	Wright Penstemon	As per Producer Info	5	LOT
32	Red Yucca	As per Producer Info	5	LOT
32	Mexican Feather Grass	As per Producer Info	5	LOT
32	Chaparral Sage	As per Producer Info	5	LOT
32	Russian Sage	As per Producer Info	5	LOT
32	Irrigation System	Required Landscape Design	1500	SF
Division 42				
46	Greywater tank	500 Gallons Marine Holding Tank	1	EA
46	Sanitary tank	500 Gallons Pure Solutions Tank Package	1	EA
46	Potable water tank	Domestic 1500 Gallons Quadel Titan Vertical Water Storage Tank - Black	1	EA
Division 48				
48	REC METER	City of El Paso Electric Company Codes	1	EA
48	SAFETY SWITCH	City of El Paso Electric Company Codes	1	EA
48	UTILITY ELECTRIC METER	City of El Paso Electric Company Codes	1	EA



CONSTRUCTION SPECIFICATIONS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.01 PROJECT INFORMATION

A. Project: ADAPT Home

1. Project Location:

500 West University Avenue El Paso, TX 79968

B. Owner: The University of Texas at El Paso & El Paso Community College

C. Architect: The University of Texas at El Paso & El Paso Community College

D. Contractor: The University of Texas at El Paso & El Paso Community College

E. Design-Builder: The University of Texas at El Paso & El Paso Community College

F. The Work consists of Design, construction, transportation and assembly of an 904 sq.ft. house.

G. Work by Owner:

H. Owner-Furnished Items: The following products will be furnished by Owner and shall be installed by Contractor as part of the Work:

1. None.

1.02 WORK RESTRICTIONS

A. Contractor's Use of Premises: During construction, Contractor will have use of area indicated. Contractor's use of premises is limited only by Owner's right to perform work or employ other contractors on portions of Project.

1. Owner will occupy premises during construction. Perform construction only during normal working hours 8 AM to 5 PM Monday thru Friday, other than holidays), unless otherwise agreed to in advance by Owner. Cleanup work areas and return to usable condition at the end of each work period.

2. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet (12.2 m) beyond building perimeter; 10 feet (3 m) beyond surface walkways, patios, surface parking, and utilities less than 12 inches (300 mm) in diameter; 15 feet (4.5 m) beyond primary roadway curbs and main utility branch trenches; and 25 feet (7.6 m) beyond constructed areas with permeable surfaces (such as pervious paving areas, storm water detention facilities, and playing fields) that require additional staging areas to limit compaction in the constructed area.



3. Driveways, Walkways, and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

B. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 1000



SECTION 01 33 26 - SOURCE QUALITY CONTROL REPORTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification section, apply to work of this section.

1.02 SECTION INCLUDES:

A. Quality assurance and control of installation.

B. References.

C. Field samples.

D. Inspection and testing laboratory services.

E. Manufacturer's field services and reports.

1.03 QUALITY ASSURANCE/CONTROL OF INSTALLATION:

A. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

B. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

C. Comply fully with manufacturer's instructions, including each step in sequence.

D. Should manufacturer's instructions conflict with Contract Documents, request clarification from Architect Engineer before proceeding.

E. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

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

G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.04 REFERENCES:

A. Conform to reference standard by date of issue current on date of Contract Documents.

B. Obtain copies of standards when required by Contract Documents.

C. Should specified reference standards conflict with Contract Documents, request clarification for Architect/Engineer before proceeding.



D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 FIELD SAMPLES:

A. Install field samples at the site as required by individual specifications Sections for review.

B. Acceptable samples represent a quality level for the Work.

C. Where field sample is specified in individual Sections to be removed, clear area after field sample has been accepted by Architect/Engineer.

1.06 INSPECTION AND TESTING LABORATORY SERVICES

A. General Contractor will appoint, employ, and pay for services of an independent firm to perform inspection and testing.

B. Qualification for Services Agencies: Inspection and testing service agencies, including independent testing laboratories shall be prequalified as complying with "Recommended Requirements for Independent Laboratory Qualifications" by the American Council of Independent Laboratories and specialize in the types of inspections and tests to be performed.

C. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

D. The independent firm will perform inspections, tests, and other services specified in individual specification Sections and as required by the Architect.

E. The agency shall notify the Architect and Contractor within 3 hours of irregularities or deficiencies observed in the Work during performance of its services.

F. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.

G. The agency shall not perform any duties of the Contractor.

H. Reports will be submitted by the independent firm to the Architect, Owner, Contractor and Consultant when required, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

I. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.

1. The Contractor is responsible for scheduling of all tests. Notify Architect/Engineer and independent firm 24 hours prior to expected time for operations requiring services.

2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.



- 3. The Contractor shall bear all extra costs due to work not being ready at scheduled time.
- 4. The Contractor shall bear all costs for tests indicating nonconformance with specified requirements.
- J. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Architect/Engineer.

1.07 MANUFACTURER'S FIELD SERVICES AND REPORTS:

- A. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installations, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplement or contrary to manufacturer's written instructions.
- C. Submit report in duplicate within 30 days of observation to Architect/Engineer for review.

PART 2 EXECUTION

3.01 REPAIR AND PROTECTION

- A. Repair damaged construction and restore work upon completion of inspection, testing and similar services.
- B. Repair and protect is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION



SECTION 01 51 00 - TEMPORARY UTILITIES

1.01 DESCRIPTION:

A. Furnish, install and maintain temporary jobsite office, fencing, barricades, and utilities required for construction, and remove such on completion of Work.

B. Related Work: Documents affecting Work of the Section include, but are not necessarily limited to, General Conditions, Special Conditions, and Sections in Divisions 1 through 16 of these Specifications.

1.02 REQUIREMENTS OF REGULATORY AGENCIES:

A. Comply with National Electric Code.

B. Comply with Federal, State and local codes and regulations and with utility company requirements.

1.03 MATERIALS:

Materials may be new or used, but must be adequate in capacity for required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

1.04 TEMPORARY ELECTRICITY AND LIGHTING:

A. Electricity required for construction may be taken from Owner's existing system without separate meter, if available. Contractor is responsible for verification of available supply.

B. Install circuit and branch wiring, with area distribution boxes located so that power and lighting is available throughout the construction by the use of construction-type power cords. Provide ground-fault circuit interrupters as required by National Electric Code for temporary wiring or extension cords.

C. Provide adequate artificial lighting for all areas of work when natural light is not adequate for work, and for areas accessible to the public in accordance with OSHA.

1.05 TEMPORARY HEAT AND VENTILATION:

A. Provide temporary heat and ventilation as required to maintain adequate environmental conditions to facilitate progress of Work, to meet specified minimum conditions for installation of materials, and to protect materials and finishes from damage due to temperature or humidity.

B. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.

C. Portable heaters shall be standard approved units complete with controls.

D. Pay all costs of installation, maintenance, operation and removal, and for fuel consumed.

1.06 TEMPORARY TELEPHONE SERVICE:



A. Arrange with local telephone service company, provide **direct line telephone and fax service at construction site** for use of personnel and employees. The construction superintendent must carry a cellular phone at all times.

B. Pay all cost for installation, maintenance and removal, and service charges for all calls.

1.07 TEMPORARY WATER:

A. If available, water required for construction may be taken from Owner's existing system without separate meter. If not available, it shall be the Contractor's responsibility to provide temporary water.

B. Install branch piping with taps located so that water is available throughout construction by use of hoses. Protect piping and fittings against freezing.

C. The use of the facilities water source shall not impair normal business activities.

1.08 TEMPORARY SANITARY FACILITIES:

A. Provide sanitary facilities in compliance with laws and regulations.

B. Service, clean and maintain facilities and enclosures.

1.09 JOBSITE OFFICE, FENCING, BARRICADES:

1. Configuration and condition to be in accordance with the Owner's standards.

1. Obtain Owner consent as to location, prior to installation.

1.10 GENERAL:

A. Comply with applicable requirements specified in Division 15 - Mechanical, and in Division 16 - Electrical.

B. Maintain and operate systems to assure continuous service.

C. Modify and extend systems as work progress requires.

1.11 REMOVAL:

A. Completely remove temporary materials and equipment when their use is no longer required.

B. Clean and repair damage caused by temporary installations or use of temporary facilities.

END OF SECTION



SECTION 01 54 19 - TEMPORARY CRANES

PART 1 - GENERAL

1.01 SUMMARY

A. Structural Performance: Temporary cranes will withstand structural loads and lifts incurred in lifting, placing, and handling of all modular components.

B. Submittals: Product Data, and structural analysis data signed and sealed by a qualified professional engineer registered in the state where the project is located.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers

1. Grove GMK 5120 B

2.02 TEMPORARY CRANES

A. Type: 120 ton, Hydraulic Crane.

1. Boom extension: 42-162 ft

5. Operational Weight: 60,000 kg

6. Total Counterweight: 42 ton

PART 3 - EXECUTION

3.01 INSTALLATION

A. Prepare ground by cleaning, removing projections, clearing obstructions, and cordoning off safe working zone, and as otherwise recommended in temporary crane manufacturer's written instructions.

B. Ground crane securely in place, per operational specifications.

C. Allow only licensed operators to operate machinery, manage lifts, and issue signals and commands.

D. Ensure placement of modular components complies with foundational spacing and load requirements.

E. Coordinate operations with structural requirements per specifications of structural engineer and crane operator.

F. Correct deficiencies in or remove and reinstall temporary cranes that do not comply with requirements.

END OF SECTION 01 54 19



SECTION 01 54 23 – TEMPORARY SCAFFOLDING AND PLATFORMS

PART 1 - GENERAL

1.01 SECTION REQUIREMENTS

A. Structural Performance: Design, engineer, fabricate, and install staging aids and fall protection equipment to withstand structural loads required by OSHA and ANSI Z359.1 standards.

B. Submittals: Product Data. Structural analysis data signed and sealed by a qualified professional engineer registered in the state where Project is located.

C. Structural and Accessory Components shall conform to the following Standards:

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Tubing: Cold-formed steel tubing, ASTM A 500.
3. Aluminum Extrusions: ASTM B 221.

PART 2 - PRODUCTS

2.01 FALL PROTECTION EQUIPMENT – STANDING SEAM ROOF

A. Manufacturers

1. Guardian Fall Protection

B. Models

1. Standing Seam Roof Clamp, Model# 00250

C. Operation

1. Portable and reusable anchor for use on standing seam roofs
2. Seam spacing range: 24" – 36"
3. Retractable Rotation: 360 degrees
4. Self-retracting lifeline adaptable
5. Meets or exceeds all applicable industry standards, including OSHA and ANSI Z359.1.

2.02 FALL PROTECTION EQUIPMENT - THERMOPLASTIC POLYOLEFIN ROOF



A. Manufacturers

1. Guardian Fall Protection

B. Models

1. CB-12 Roof Anchor, Model# 00485

C. Operation

1. Deck mounted anchor post

2. Load rating: 5000 lbs

3. Base and mount plates flashed into TPO membrane per manufacturer specifications.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Prepare substrate by cleaning, removing projections, filling voids, sealing joints, and as otherwise recommended in fall protection and deck eye manufacturer's written instructions.

B. Set units level, plumb, and true to line, without warp or rack of frames and panels and anchor securely in place, for permanent installation or duration of use.

C. Fasten fall protection securely in place, with provisions for thermal and structural movement.

D. Correct deficiencies in or remove and reinstall fall protection anchors that do not comply with requirements.

E. Repair, refinish, or replace fall protection anchors and deck eyes damaged during installation, as directed by Architect.

END OF SECTION 01 54 23



DIVISION 05 – METALS

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 GENERAL

1.01 DESCRIPTION:

A. Miscellaneous metal required for this Work is indicated on the Drawings and includes metal items not described in other Sections of these Specifications, such

as, but not limited to, prefabricated and field constructed steel stairs and railings, brick ledges, and other steel items not covered under structural steel work.

The General Contractor, shall assume the overall responsibility for the provision of all miscellaneous metal and structural steel items. All exterior steel items shall be galvanized.

B. Related work described elsewhere: Concrete Work (Section 03300), Structural Steel (Section 05120).

1.02 WORK INCLUDED:

This section includes, but is in no way limited to, Steel Stair, Railings, Bollards, brick ledges, slab angles, support frames, and related items, which are not specifically covered by Section 05120 - Structural Steel.

1.03 QUALITY ASSURANCE:

Code for fabrication and erection: conform to applicable requirements of latest edition of A.I.S.C. Specifications for Design, Fabrication and Erection of Structural Steel for Buildings, A.I.S.C. Code of Standard Practice for Steel Buildings and Bridges, Code of Arc and Gas Welding in Building Construction of American Welding Society, and AISI Specifications for Design of Cold-Formed Steel Structural Members.

1.04 SUBMITTALS:

Submit shop drawings for miscellaneous metal items in accord with requirements stated in General Conditions and Shop Drawings and Submittals (Section 01340).

1.05 PRODUCT HANDLING:

All miscellaneous metal items shall be stored off the ground and protected from damage. All damaged materials shall be repaired or replaced immediately with no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS:

A. Steel shapes: Conform to ASTM A36, Specifications.

B. Steel plates: Conform to ASTM A283, Specifications.



C. Aluminum: Alloy 6063-T52 for extrusions, alloy 214 for castings.

D. Paint: SSPC Paint 13 Red Oxide, unless otherwise specified.

E. Arc welding electrodes: AWS A5.1.

F. Hot dip galvanizing: Appropriate ASTM American Hot Dip Galvanizers Association, Inc. Specifications.

2.02 MISCELLANEOUS ANGLES, PLATES, BARS, HANGERS, BRACES:

Sizes indicated on Drawings, and as needed to support, brace or function as shown.

PART 3 EXECUTION

3.01 FABRICATION:

A. Verify measurements in field, as required for work fabricated to fit job conditions. Insofar as possible, shop assemble and fit, ready for erection. Make structural steel connections, part and accessories, where applicable, conform to A.I.S.C. governing code. Execute work with sharply defined profiles, true and in proper plane with finished (exposed) surfaces and edges smooth and free from defects. Jointing and intersections of metal precision fitted with adequate fastenings. Conceal fastening where possible.

B. Provide holes as required for work of other trades. Paint dissimilar metals which are in contact with coat of bitumastic paint. All welding to conform to requirements of governing code and all welders to be licensed operators. When weld type not noted, provide continuous fillet weld. After welding, butt and grind welds smooth where exposed in finished work.

3.02 SHOP PAINTING:

A. After inspection, approval and before steel work leaves shop, clean off rust, mill scale, slag or flux deposit and foreign matter by means of steel scrapers, wire brushes or by other means elected by fabricator. Remove oil and grease with solvent.

B. Paint one coat shop paint thoroughly and evenly to dry surfaces by brush, pressure spray, roller coating, flow coating at election of fabricator. Air spray equipment not allowed. Apply shop coat in accordance with good painting practice, following manufacturer's instructions for thinning. Do not paint when steel surface temperature is below dew point of atmosphere. Dry film thickness: not less than 2.0 mills. Do not paint surfaces within two inches of surfaces to be field welded. Give surfaces to be welded a coat of linseed oil.

3.03 GALVANIZING:

A. Hot dip galvanize ferrous metal for all exterior work, and other items indicated.

B. Galvanizing: Hot dip galvanized after fabrication as per appropriate ASTM, American Hot Dip Galvanizers Association, Inc. Specifications. Galvanizing weight in accord with ASTM A90, minimum 2 oz per sq. ft.

3.04 FASTENING DEVICES:



A. Provide required devices for complete installation of work, including bolts, screws, nuts, inserts, clip angles, expansion bolts, etc. Devices for exterior ferrous metal work: galvanized.

B. Install anchorage devices as required in concrete as that work progresses. Erect work plumb, straight, true, accurately fitted with tight joints, securely anchored.

END OF SECTION



SECTION 05 58 00 - FORMED METAL FABRICATIONS

PART 1 - GENERAL

1.01 SECTION REQUIREMENTS

A. Structural Performance: Design, engineer, fabricate, and install aluminum channel and angles to withstand structural loads required by International Residential Code 2009.

B. Submittals: Product Data.

PART 2 - PRODUCTS

2.01 ALUMINUM CHANNELS, ANGLES AND ROD

A. Manufacturer: BMG Metals

1. Aluminum channel and angles to be used in fabrication of screen element on north side of pergola.
2. System to be constructed per drawings using appropriate fastenings and hardware.
3. Aluminum components will support light-weight wooden screen system and shall mount to primary structural members of exterior pergola framing system.
4. 6063-T5 Aluminum Extruded Channel
5. 1-1/2" x 1-1/8" channel
6. 1" x 3/4" channel
7. 1" x 1" aluminum angle
8. 1/2" aluminum rod

2.02 FINISHES

Mill Finish, typical for all exterior applications

PART 3 - EXECUTION

3.01 INSTALLATION

A. Prepare substrate by cleaning, removing projections, filling voids, sealing joints, and as otherwise recommended in aluminum channel and angle manufacturer's written instructions.

B. Set units level, plumb, and true to line, without warp or rack of frames and panels and anchor securely in place.

C. Fasten aluminum framework securely in place, with provisions for thermal and structural movement. Install with concealed fasteners, unless otherwise indicated.



D. Separate dissimilar metals and metal products from contact with wood or cementitious materials, by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.

E. Correct deficiencies in or remove and reinstall any aluminum extrusion that does not comply with requirements.

F. Repair, refinish, or replace aluminum extrusions and connecting hardware damaged during installation, as directed by Architect.

END OF SECTION



DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

SECTION 06650
SOLID POLYMER FABRICATIONS

PART 1—GENERAL

1.01
SUMMARY

A. Section includes: Furnishing and installing AVONITE® products, as indicated and as specified. B. Work Specified in this Section:

1. Countertops, sinks, splashes and shelves.
2. Toilet partitions, wainscot, wall panels and window sills.
3. One piece vanity tops and sink bowls.
4. One piece kitchen tops and sink bowls.
5. Shower/tub enclosures.
6. Drilling of holes as required.
7. Installation of above listed items.

C. Related Work:

1. Supports for countertops and sinks.
2. Plumbing piping and trim.
3. Cabinet and fixture work.

1.02
REFERENCES

A. American Society for Testing and Materials (ASTM):

C501 Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abrader.

D256 Impact Resistance of Plastics and

Electrical Insulating
Materials.

D570 Water Absorption of Plastics.

D638 Tensile Properties of Plastics.

D696 Coefficient of Linear Thermal Expansion of Plastics. D2583 Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

E84 Surface Burning Characteristics of Building Materials.

B. National Electrical Manufacturers Association (NEMA)

LD.3 High Pressure
Decorative Laminates.



1.03 SUBMITTALS

- A. Samples: If colors are indicated on drawings, submit an 8" square sample of each selected color. If colors are not indicated on drawings, submit manufacturer's standard color book showing colors of actual material in not smaller than 1-1/2" (36mm) size. Following selection of colors, submit samples as specified above.
- B. Shop Drawings: Fabricator shall provide detailed and dimensioned shop drawings showing all details of fabrication, edging, sink installation, coving, and seams. Indicate fastener types and locations, sealant proposed for use, and fabrication details of support brackets.
- C. Manufacturer's Instructions: Submit complete manufacturer's fabrication and installation instructions.
- D. Upon completion, furnish the Owner one set of manufacturer's recommended cleaning procedures.

1.04 QUALITY ASSURANCE

- A. Where homogeneous plastic or solid polymer is indicated on drawings, the material shall be "AVONITE," manufactured by AVONITE, INC., 1945 Highway 304, Belen, NM 87002, 800-428-6648.

- B. Installer Qualifications: Installation of AVONITE shall be by a firm that is authorized by AVONITE to fabricate and install AVONITE, and that can demonstrate successful experience in installing finished carpentry items similar in type and quality to those required for this Project.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Transport and handle sheets and fabricated items by methods that will prevent damage and defacing.
- B. Storage: If units are not installed immediately upon delivery to site, store in covered location, off the ground or floor, and cover with moisture- and stain-resistant paper or plastic.

1.06 ENVIRONMENTAL CONDITIONS

- Obtain and comply with AVONITE advice for optimum temperature and humidity conditions for AVONITE during its storage and installation.

1.07 WARRANTY

- Furnish the manufacturer's ten year warranty against defective materials and workmanship.

PART 2—PRODUCTS

2.01 MATERIAL

A. General: AVONITE shall be non-porous, homogeneous blend of polyester or acrylic alloys and fillers to create a material that cuts like wood. The color and pattern shall extend throughout the material. The material shall be in 1/4" (6mm) or 1/2" (12mm) thickness as indicated, in one piece wherever possible.

B. Properties: The material shall conform to the following properties:

TECHNICAL DATA PROPERTY

TECHNICAL DATA PROPERTY	TYPICAL VALUES					TEST METHOD
	CLASS I	FORMSTONE™ ACRYLIC	CLASS III	CRYSTELLE CLASS I	CRYSTELLE CLASS III	
Specific Gravity	25.5	27.7	19.5	27.0	20.6	(grams/cu. in.)
Hardness	55	60	45	58	45	ASTM D2583
Elongation (percent)	0.42	2.2	0.55	0.36	0.38	ASTM D638
Tensile strength (psi)	4,200	4,200	3,000	3,520	2,440	ASTM D638
Tensile modulus	11x10 ⁵	11x10 ⁵	5x10 ⁵	11x10 ⁵	6.5x10 ⁵	ASTM D638
Abrasion resistance @ 1000 cycles, grams	0.4	—	0.4	0.9	0.5	ASTM C501
Water absorption after 24 hours, percent	.06	.07	.08	.05	.03	ASTM D570
⊕ Izod impact foot pounds per inch	0.2	0.3	0.2	0.3	0.2	ASTM D256
Impact resistance 1/2 pound	No fracture	No fracture	No fracture	No fracture	No fracture	NEMA LD3-3.3
Linear thermal expansion	1.8x10 ⁻⁵	2.0x10 ⁻⁵	3.4x10 ⁻⁵	2.4x10 ⁻⁵	3.3x10 ⁻⁵	ASTM D696
High temperature resistance	No effect	Slight effect	No effect	No effect	No effect	NEMA LD3-3.6
Boiling water resistance	No effect	No effect	No effect	No effect	No effect	NEMA LD3-3.5
Stain resistance	No effect	No effect	No effect	No effect	No effect	NEMF LD3-3.9
Weight per sq. ft., 1/2" (12mm) thickness, pounds	4.0	4.4	3.1	4.0	3.1	
Flame spread classification	I	I	III	I	III	ASTM E84

C. Fabrication and Installation Materials.

1. Joint Adhesive:

Type recommended by manufacturer, in color to match AVONITE.

2.02

FABRICATION

A. AVONITE shall be fabricated by an authorized AVONITE fabricator.

B. AVONITE countertops shall be the thickness indicated, one piece wherever possible, and with flush joints sealed with joint adhesive where required. Avonite guarantees color match within the crate. Follow Avonite standard "Color Matching" procedures (see Fabrication Manual) when joining sheets from outside the crate. Shop shall fabricate in the largest sections possible for transporting and building access.

C. Ease top and front edges and corners.



D. AVONITE paneling and shower/tub enclosures shall be fabricated of 1/4" (6mm) thick material unless otherwise indicated. Vertical seams in shower/tub enclosures and other wet areas shall be joined as detailed.

E. AVONITE shall be fabricated to field measurements. Seams shall be located where shown on approved shop drawings. Provide seam blocks under

all seams where necessary in accordance with manufacturer's recommendations.

F. Edge detail shall be as selected by Architect or Designer.

G. Backsplash height shall be according to detail provided.

H. Back splashes shall be field installed, with tight, sealed joints.

or, paragraph below is extra cost option

H. Coves: Provide shop fabricated, integrally molded coves at back and ends where against walls or other vertical surfaces, with 3/8" radius between top and splash.

I. Finish of exposed surfaces shall be (matte, satin or polished) according to the methods prescribed by the manufacturer.

J. Sinks shall be selected from manufacturer's standard sink designs and colors, and shall be formed integrally into countertops. or, use paragraph below if sinks are material other than Avonite

J. Cutouts for sinks furnished by others shall be smooth and uniform without saw marks. The top and bottom of sink openings shall be finished smooth. Corners of sink cutouts may be radiused to a minimum of 1/4" (6mm).

2. Silicone sealant: Type recommended by manufacturer

PART 3 - EXECUTION

3.01 EXAMINATION

Verify that counters and supports are suitable for installation in accordance with shop drawings.

3.02

INSTALLATION

A. Install tops in locations indicated, conforming to manufacturer's recommended installation procedures. Set tops on supports, and anchor using fasteners shown on approved submittals.

B. Use silicone sealant for attaching back splashes and reveal edges. Seal all joints with sealant.

C. Field joints shall be hard seamed unless otherwise specified.

3.03

CLEANING

At completion of work, remove all excess material, dirt, dust, trash and other materials resulting from the installation. Clean surfaces of AVONITE, remove all labels and leave the area clean.

3.04

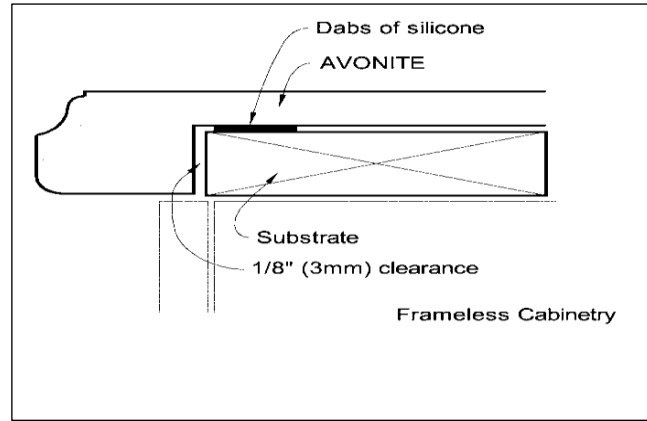
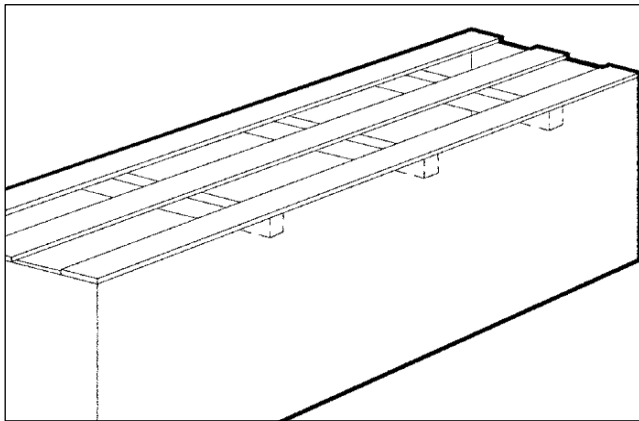
PROTECTION

Provide suitable protection on counters and other AVONITE surfaces to protect the installation from damage until final acceptance. Place temporary covers over AVONITE sinks to preclude their use for construction purposes

RECOMMENDED SUBSTRATES

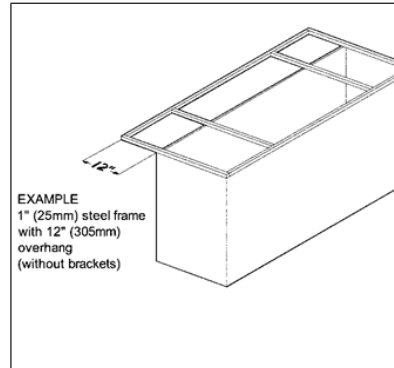
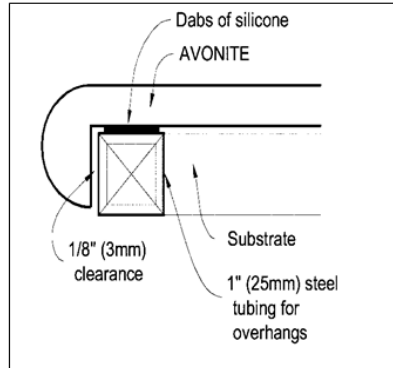
The illustrations shown below demonstrate typical substrate requirements needed to properly support AVONITE® materials. As a general rule, solid substrates should be used only for furniture or vanity tops, or overhangs where heat sources are not present.

RUNNER METHOD Frameless cabinets require the thickness of the top edge to clear doors and drawer fronts.



The runner method uses 1"x4" supports that run parallel to the length of the cabinets. These supports are placed in the front, center and rear and require cross supports every 18"-24" (45-60cm). These supports should be mechanically secured to cabinets.

COOKTOP OVERHANGS



For overhangs exceeding 6" (72mm) and where heat sources are present, use steel tubing. For example: a kitchen island with a cooktop and overhang.

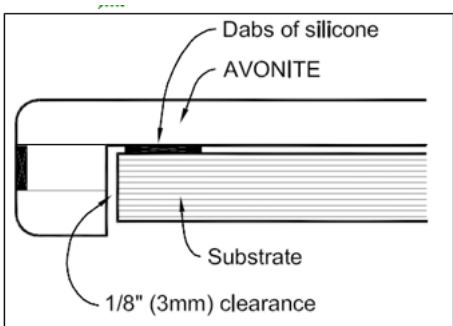
Steel frame should be mechanically secured to the cabinetry which will provide a cantilevered support.

Drawings available for download at www.avonite.com in either .dwg or .pdf format.

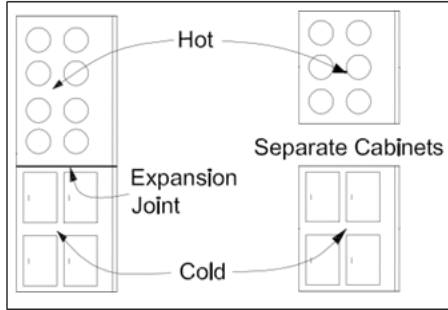
COMMERCIAL FOOD SERVICE TOPS

The following features must be included in a commercial food service installation in order to be covered by Avonite's 10-Year Material and/or Installed Warranty. Color must be selected from among Avonite's Class I fire rated products.

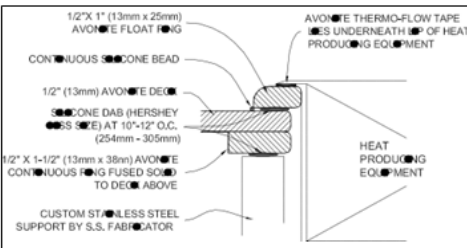
1. Cabinet must be even and level with no protrusions to cause cracking.
2. Support tops every 18" (45.7cm). Cantilevers over 6" (15.2cm) require structural support. Provide support within 3" (7.6cm) of all cut outs.
3. Hot and cold units must be supported from below and not rest on the Avonite top.
4. Attach Avonite to support frame with dabs of silicone every 18"-24" (45.7-61cm) ; do not use a continuous bead.



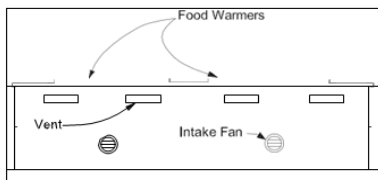
5. Separate tops containing hot sections from those with cold sections. A soft (silicone) seam may be used.



6. Make cut outs with router and template and allow a 1/2" (1.2cm) radius in the corners. Cut and sand a 1/8" (.3cm) round over on top and bottom edge of cut out.
7. Reinforce corners of rectangular cut outs with 6"x 6" (15.2x15.2cm) blocks of Avonite. circular cut outs must have a continuous ring of Avonite 2" (5cm) wide as reinforcement.
8. Use a layer of Thermo-Flow tape to line the perimeter of all hot and cold cut outs.



9. Hot well units must be covered with a layer of Flex-Sulation blended PVC foam sheeting. The foam may be attached to the hot well with 3M® double sided aircraft tape, or duct tape.
10. Cabinets are to be ventilated by installing a fan near the bottom to pull cool air into the cabinet and by providing vent slots near the upper edge of the cabinet to expel the hot air. Temperatures in the cabinet must not exceed 170°F (78°C).



Drawings available for download at www.avonite.com in either .dwg or .pdf format.

11. Sneeze guards must be fastened to the cabinets or the floor, not directly to the Avonite. Holes in the Avonite to accommodate the sneeze guard supports must be cut 1/4" (.6cm) oversize in diameter to allow for expansion and contraction.
12. Deck seams must be reinforced with a 3" - 4" (7.6-10cm) seam block. Keep seams 3" (7.6cm) or more away from cutouts.

SCOPE OF WORK

Provide AVONITE® surfaces as shown on the drawings and specifications herein



MATERIALS

AVONITE sheets shall be as supplied by AVONITE, Inc., Belen, New

Mexico, and shall be cut to size, seamed and detailed in accordance

with approved shop drawings. Color shall be (specify) _____ and surface finish shall be (matte, satin, gloss) _____ .

SHOP DRAWINGS

Prior to fabrication, the contractor shall furnish and submit detailed shop drawings for the approval of the architect/designer, showing accurate dimensions and details of all AVONITE solid surface work.

FABRICATION AND INSTALLATION

The fabrication and installation of all AVONITE surfaces detailed in this section shall be performed by an Accredited Fabrication shop in accordance with the manufacturer's printed instructions and final shop drawings.



SECTION 06 12 00 STRUCTURAL INSULATED PANELS

GENERAL

SUMMARY

Section Includes: Structural Insulated Panels (SIPs).

Related Sections: Section(s) related to this section include:

Section 06 10 00 Rough Carpentry

Section 06 09 00 Wood and Plastics Fastenings

SYSTEM DESCRIPTION

Structural Insulated Panels (SIPs) consist of oriented strand board (OSB) laminated with structural adhesives to a termite resistant EPS insulation core, a EPA registered treatment for mold, mildew, and termites, and SIP Manufacturer supplied connecting splines, sealants, and SIP screws.

REFERENCES

ACSE 7 - Minimum Loads for Buildings and other Structures.

ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

DOC PS2 – Performance Standard for Wood-based Structural-Use Panels.

ICC ES AC04 – Acceptance Criteria for Sandwich Panels.

ICC ES AC05 – Acceptance Criteria for Sandwich Panel Adhesives.

ICC ES AC12 – Acceptance Criteria for Foam Plastic Insulation.

ICC ES AC239 – Acceptance Criteria for Termite-Resistant Foam Plastics.

AWPA E1 - Standard Method for Laboratory Evaluation to Determine Resistance to Subterranean Termites.

AWPA E12- Standard Method of Determining Corrosion of Metal in Contact with Treated Wood.

ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

EPA - Registered products listing.

DESIGN REQUIREMENTS

Provide SIPs which have been manufactured, fabricated and installed to withstand loads [Specify code/standard reference.] and to maintain [Specify performance criteria.] performance criteria stated by SIP manufacturer without defects, damage or failure.



SUBMITTALS

Product Data: Submit product data for specified products.

SIP Code Compliance: Provide ICC ES code report for SIP with evidence of compliance with code requirements as an alternate method of construction. Submit current compliance report number from ICC ES showing conformance to the 2012 International Building Code (IBC) and International Residential Code (IRC). Code report shall include compliance with ICC ES AC04 (Sandwich Panels) dated February 2012.

EPS Code Compliance: Provide ICC ES code report for EPS foam with evidence of compliance with code. Submit current compliance report numbers from ICC ES with conformance to the 2012 International Building Code (IBC) and International Residential Code (IRC). Code report shall include compliance with ICC ES AC12 (Foam Plastic) dated February 2011 and ICC ES AC239 (Termite-Resistance) dated October 2008.

Manufacturer's Instructions: SIP Manufacturer's Construction Manual and load design charts.

Calculations: Provide structural calculations by a registered architect or professional engineer [in the state of] qualified to perform such work.

Shop Drawings: Submit shop drawings for SIPs showing layout, elevations, product components and accessories.

Quality Assurance Submittals: Submit the following:

Certificate: Product certificate showing compliance to Third Party Quality Control program of PFS Corp.

Fire Resistant Assemblies: PFS construction number for each fire-rated assembly

Warranty: Warranty documents specified herein.

QUALITY ASSURANCE

Installer Qualifications: Installer should be experienced in performing work of this section and should have specialized in installation of work similar to that required for this project.

Source Limitations: Obtain all SIPs through one source. All accessories to be as furnished or recommended by the SIP manufacturer.

Regulatory Requirements:

SIPs shall be recognized for compliance with [International Building Code, International Residential Code, or specify] in a current ICC ES evaluation report

Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, foundation/structural system/substrate conditions, SIP manufacturer installation instructions and SIP manufacturer warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.

DELIVERY, STORAGE & HANDLING



Ordering: Comply with SIP manufacturer ordering instructions and lead time requirements to avoid construction delays.

Delivery: Deliver materials from SIP manufacturer with identification labels or markings intact.

Off-load SIPs from truck and handle using fork lift or other means to prevent damage to SIPs.

SIPs shall be fully supported in storage and prevented from contact with the ground. Stack SIPs on pallets or a minimum of three stickers for every 8 feet of SIP length.

SIPs shall be fully protected from weather. Protect against exposure to rain, water, dirt, mud, and other residue that may affect SIP performance. Cover stored SIPs with breathable protective wraps. SIPs shall be stored in a protected area.

WARRANTY

Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

Manufacturer's Warranty: Submit SIP manufacturer's standard warranty document. SIP Manufacturer warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

Warranty Period: [Specify term.] years commencing on Date of Substantial Completion.

PRODUCTS

Note to Specifier Select the name and address of the local Licensed R-Control SIP Manufacturers/Suppliers.

Manufacturers/Suppliers:

ACH Foam Technologies, LLC, 5250 North Sherman St., Denver, CO 80216

ACH Foam Technologies, LLC, 111 W. Fireclay Ave., Murray, UT 84107

ACH Foam Technologies, LLC, 775 Waltham Way, Suite 105, McCarran, NV 89434

ACH Foam Technologies, LLC, 90 Trowbridge Drive, Fond du Lac, WI 54936-0660

ACH Foam Technologies, LLC, 4001 Kaw Drive, Kansas City, KS 66102

ACH Foam Technologies, LLC, 1418 Cow Palace Road, Newton, KS 67114

ACH Foam Technologies, LLC, 809 East 15th Street, Washington, IA 52353

ACH Foam Technologies, LLC, 2731 White Sulphur Road, Gainesville, GA 30501

Big Sky Insulations, Inc., 15 Arden Drive, Belgrade, MT 59714

Branch River Plastics, Inc., 15 Thurber Boulevard, Smithfield, RI 02917



Energy Systems, Inc. 990 Epco Dr., Dandridge, TN 37725

Mid-Atlantic Foam, 326 McGhee Road, Winchester, VA 22603

NoArk Enterprises, Inc., 10101 Highway 70 East, North Little Rock, AR 72117

Thermal Foams, Inc., 2101 Kenmore Avenue, Buffalo, NY 14207

AFM Corporation, 17645 Juniper Path, Suite 260, Lakeville, MN 55044

Materials

SIPs consisting of the following:

UL certified EPS core with Perform Guard treatment, minimum of 0.95 pcf (15.2 kg/m³) complying with ASTM C578 Type I and having ICC ES recognition of termite resistance. Insulation manufacturer shall provide Third Party UL certificate. ICC ES report shall be provided for recognition of termite resistance in compliance with ICC AC239.

OSB identified with APA or TECO performance mark with Exposure I durability rating and performance in accordance with DOC PS-2 span rating 24/16 or greater.

Adhesives shall be in conformance with ICC ES AC05 – Acceptance Criteria for Sandwich Panel Adhesives

FrameGuard treatment for mold, mildew, and termite resistance meeting the following requirements:

- a. Registered with EPA.
- b. Mold growth: 0 rating, tested to ASTM D3273 for 8 weeks at 77 degrees F and 100 percent relative humidity.
- c. Termite resistance: Minimum rating of 7.0, tested to AWPA E-1.
- d. Corrosion potential for metals in contact with treated wood: Maximum 2 mils per year, tested to AWPA E12 for minimum of 60 days on aluminum 2024, carbon steel, hot-dip galvanized steel, and G90 galvanized steel.
- e. Equivalent lateral resistance and tooth holding capacity as untreated wood.

Accessories

Splines: OSB, block splines, or I-beam for use in joining SIPs shall be supplied by SIPs manufacturer.

Fasteners: corrosion resistant SIP screws compatible with SIP system shall be provided by the SIPs manufacturer.

2. Wood Screws for attachment to wood members
3. Heavy Duty Metal Screws for attachment to metal members (16 gauge to 3/16")
4. Light Duty Metal Screws for attachment to metal decks (18 gauge or thinner)



SIP Sealant: Shall be specifically designed for use with SIPs. Sealant must be compatible with all components of the SIP. Sealant shall be provided by the SIP manufacturer. VOC content of SIP sealant shall be less than 10 g/L.

Dimensional Lumber: SPF, #2 or better, or engineered equivalent unless otherwise required by structural drawings.

Vapor Barrier SIP Tape: 40 mil thick, butyl adhesive suitable for indoor use, min. 6 inch wide for use on SIP joints as specified by designer. SIP Tape shall be supplied by the SIP manufacturer.

Fabrication

Sizes: SIPs shall be fabricated in accordance with approved Shop Drawings

Thermal Resistance, R-value

Note to Specifier Select the R-value as required for each area of construction.

5. 4 1/2" (114 mm) thick SIP with R-value of 15 at 75°F (16 at 40°F)
6. 6 1/2" (165 mm) thick SIP with R-value of 23 at 75°F (24 at 40°F)
7. 8 1/4" (210 mm) thick SIP with R-value of 29 at 75°F (32 at 40°F)
8. 10 1/4" (260 mm) thick SIP with R-value of 37 at 75°F (40 at 40°F)
9. 12 1/4" (311 mm) thick SIP with R-value of 45 at 75°F (48 at 40°F)

Note to Specifier SIPs can be designed for use as 1 hour fire resistant assemblies. See technical information publications from SIP manufacturer.

Fire Performance Rating: [Specify fire performance rating.].

Note to Specifier Edit article below to suit project requirements. If substitutions are permitted, edit text below. Add text to refer to Division 1 Project Requirements (Product Substitutions Procedures) Section.

PRODUCT SUBSTITUTIONS

Substitutions: No substitutions permitted without fourteen day (14) prior approval.

RELATED MATERIALS

Related Materials: Refer to other sections for related materials as follows:

Dimensional Lumber: SPF #2 or better or pre-engineered equivalent: Refer to Division 6 Carpentry Sections.

SOURCE QUALITY

Source Quality Assurance: Each SIP component required shall be supplied by SIP manufacturer and shall be obtained from selected SIP manufacturer or its approved supplier.



Each SIP shall be labeled indicating PFS Third Party certification.

Provide evidence of UL Third Party inspection and labeling of all insulation used in manufacture of SIPs.

SIP manufacturer shall provide Lamination, R-Value and mold/mildew/termite resistance warranty documents for building owner acceptance. Manufacturer standard forms will be submitted.

Provide SIPs with Foam-Control EPS with Perform Guard for termite resistance. Treatment shall be EPA registered with treatment efficacy substantiated by ICC ES report.

Provide SIPs with FrameGuard treatment for mold, mildew, and termite resistance. Treatment shall be EPA registered with treatment efficacy substantiated by independent research.

Dimensional Tolerance - shall comply with values listed in the manufacturer's Quality Control Manual.

Source Quality: Obtain SIPs from a single manufacturer.

EXECUTION

MANUFACTURER'S INSTRUCTIONS

Compliance: Comply with manufacturer's ICC ES report, Load Design Charts, Construction Manual, Shop Drawings, and product data, including product technical bulletins, for installation.

Plans shall be reviewed by a qualified architect/engineer and shall be signed and/or sealed. Deviations from standard detail and load design values shall be calculated and signed and/or sealed by a qualified architect/engineer.

EXAMINATION

Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions.

Verify conditions of foundation/structural system/substrate and other conditions which affect installation of SIPs. Any adverse conditions shall be reported in writing. Do not proceed with installation until adverse conditions are corrected.

INSTALLATION

SIP Installation:

Note to Specifier Complete installation recommendations are available from the manufacturer. SIP weight and contractor preference will dictate the erection method used. The use of a crane or lift truck may be required for SIP placement. Consult with SIP manufacturer for recommended handling methods. Supplementary lifting clamps and attachments to be provided by the contractor.

SIP Supports: Provide level and square foundation/structural system/substrate that support wall and/or roof SIPs. For wall SIPs, hold sill plate back from edge of rim board 7/16" (11 mm) to allow full bearing of OSB skins. Provide



1 1/2" (38 mm) diameter access holes in plating to align with electrical wire chases in SIPs. Provide adequate bracing of SIPs during erection. Remove debris from plate area prior to SIP placement.

SIP Fastening: Connect SIPs by nails as shown on drawings. SIP sealant must be used together with each fastening techniques. Where SIP Screw Fasteners are used, provide a minimum of 1" (25.4 mm) penetration into support. Join SIPs using plates and splines. Secure attachment with nails, staples, or screws, and SIP sealant. Apply SIP sealant following SIP manufacturer recommendations.

SIP Tape: Provide SIP Tape at joints between SIP panels and at intersection of SIP roof and wall.

Vapor Retarders: Provide vapor retarders mandated by building code or climate conditions.

Thermal Barriers: Interior surfaces of SIPs shall be finished with a minimum 15-minute thermal barrier, such as 1/2" (13 mm) gypsum wallboard, nominal 1" (25 mm) wood paneling, or other approved materials. Apply code approved thermal barriers according to SIP manufacturer's recommendations.

Restrictions: Do not install SIPs directly on concrete. Do not put plumbing in SIPs without consulting SIP manufacturer. Do not overcut skins for field-cut openings and do not cut skins for electrical chases. SIPs shall be protected from exposure to solvents and their vapors that damage the EPS foam core.

Remove and replace insulated wall or roof SIPs which have become excessively wet or damaged before proceeding with installation of additional SIPs or other work.

FIELD QUALITY REQUIREMENTS

Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

Site Visits: [Specify number and duration of periodic site visits].

PROTECTION

Protection: Protect installed product and finish surfaces from damage during construction.

Roof SIPs: Protect roof SIPs from weather. Provide temporary protection at the end of the day or when rain or snow is imminent.

After installation, cover SIPs to prevent contact with water on each exposed SIP edges and faces.

END OF SECTION

SECTION 06 11 13 - ENGINEERED WOOD PRODUCTS



PART 1 - GENERAL

1.01 SECTION REQUIREMENTS

A. Submittals: Product Data

B. Manufacturer's published values of allowable design stresses shall be demonstrated by comprehensive testing.

PART 2 - PRODUCTS

2.01 LOCK DECK

A. Dimensions: 2" x 6" nominal, 1-1/2" x 5-1/2" actual

B. Provide continuously supported, random length laminated decking in one of the following species:

1. Douglas Fir

2. Larch

3. Southern Pine

2.02 Parrallam PSL Column

A. Dimension: 6" x 6" nominal, 5 1/4" x 5 1/2" actual

B. Solid, one-piece column members used in dry-service conditions (SC1 and SC2).

C. Loads are based on simple axial-loaded columns using the design provisions of BS5268: Part 2, 2002 edition.

D. The modification factor for compression members K_{12} is calculated using the equation in Annex B.

E. The eccentricity factor (d) is taken as 0.01 of the slenderness ratio (h).

F. For side loads or other combined bending and axial loads, see provisions of BS 5268: Part 2, 2002 edition

2.03 FINISHES

A. Lock Deck: Factory clear matte sealer, natural finish.

B. Parrallam PSL Column: Wolmanized

PART 3 - EXECUTION

3.01 INSTALLATION

A. Lock Deck:



1. The deck must be continuous over three or more spans of approximately equal length, with each piece of deck over at least one support. Other situations require special design.
 2. Place decking to disperse end-joints as randomly as possible.
 3. The distance between end-joints in adjacent rows of decking is at least two feet.
 4. The distance between end-joints in rows of decking separated by only one row is at least one foot.
 5. End spans shall be carefully planned and placed. To ensure that end spans perform as indicated by the Span Tables, follow one of these practices:
 - a. Eliminate end-joints in one-third of the decking courses, or
 - b. Provide a cantilevered overhang, free of end-joints, equal to 20% of the end span, or shorten the end span by 10%.
 - c. Where one of these practices cannot be applied, end span deflection may exceed the values shown.
 6. Toenailing along courses: 8d at 30" o.c. for 2" nominal thickness
 7. Face Nailing to Supports 20d for 2" nominal thickness
- B. Parallam PSL Column:
1. Install to full compliance with specifications and details of manufacturer.

END OF SECTION

SECTION 06 1123 - LAMINATING ADHESIVES PART 1 - GENERAL**1.1 SECTION INCLUDES**

- A. Shop and field applied contact adhesives for postforming and non-postforming laminate applications.
- B. Cold press PVA applications. C. Hot press PVA applications.
- D. Pinch roller/postforming PVA applications.

1.2 RELATED REQUIREMENTS

- A. Division 06: Wood Plastics and Composites (Interior Architectural Woodwork, Finish Carpentry, Architectural Wood Casework, Wood Paneling). B. Division 08: Interior Doors.
- C. Division 10: Interior Specialties (Toilet Partitions).
- D. Division 12: Furnishings (Laminate Clad Casework, Specialty Casework, Residential Casework, or Office, Retail, Hospitality, Institutional Furniture).

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 3000.
- B. Product Data: Submit manufacturer's technical data sheet for specified products, including literature for High Pressure Decorative Laminate, adhesive for bonding plastic laminate, and substrate information as related.
- C. Shop Drawings: Submit showing layout, profiles and product components, including edge conditions, panel joints, accessories, designs and textures.
- D. Manufacturer's installation and application instructions. E. Certificates: Submit the following:

- 1. GREENGUARD Children & Schools.
- 2. GREENGUARD Indoor Air Quality. F. Quality

Assurance Submittals:

- 1. Submit certified test reports showing compliance with specified performance characteristics and physical properties if required.
- 2. Manufacturer's Safety Data Sheets (MSDS).

1.4 REGULATORY REQUIREMENTS

- A. SCAQMD (South Coast Air Quality Management District), Rule 1168 – Adhesive and Sealant Applications.
- B. California Air District Regulations.



C. Ozone Transport Commission (OTC) model Rule for Adhesives and Sealants.

1.5 QUALITY ASSURANCE A.

Certification:

1. GREENGUARD Children & Schools Certified.
 2. GREENGUARD Indoor Air Quality Certified. B.
- LEED rating system potential credits:

1. LEED-NC and LEED-CI IEQ Credits 3.2.
2. LEED-NC and LEED-CI IEQ Credits 4.1.
3. LEED-NC and LEED-CI IEQ Credits 4.4.
4. LEED-NC and LEED-CI IEQ Credits 4.5.
5. Refer to specific adhesive data sheet for available credits.

1.6 DELIVERY, STORAGE & HANDLING

- A. Comply with Division 01 Product Requirements Sections.
- B. Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.

1.7 PROJECT CONDITIONS

- A. For best results, do not apply adhesives at temperatures below 65°F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS A. Adhesives:

1. Wilsonart Adhesives, a division of Wilsonart International, Inc., 10601 NW H.K. Dodgen Loop, Temple, TX 76504, (800) 433-3222, WilsonartAdhesives.com.
2. Or equal.

Edit Note:	
Applications	Applicable Wilsonart Adhesives
Contact	1730/1, H ₂ O
Contact Canister	730/1
PVA - Cold Press	3100, 3105, 3116

PVA – Hot Press	3131, 3132
PVA – Pinch/Postforming	3000, 3001

2.2 CONTACT ADHESIVES A. Non-postforming:

1. 1730/1731 Low VOC Contact Adhesive.
2. 730/731 Contact Adhesive, low VOC canister. B.

Postforming:

1. H₂O Contact Adhesive, water-based.

C. Water-resistant, non-staining bond for common High Pressure Laminate (HPL) applications.

D. Limitations: Avoid contact with copper. Avoid vinyl surfaces containing plasticizers.

2.3 COLD PRESS PVA ADHESIVES A. 3100
 PVA Adhesive

1. For bonding decorative laminate to wood products. B.
 3105 PVA Adhesive

1. High solids, for bonding decorative laminate to wood products. C.
 3116 PVA Adhesive

1. For bonding decorative laminate to wood products and bonding paper-backed products.

D. Limitations:

1. Avoid tempered hardboard, fire retardant treated materials, moisture resistant treated materials, low pressure melamine, metallic, polyester, and painted surfaces, wheatboard, and strawboard.

2.4 HOT PRESS PVA ADHESIVES A. 3131
 PVA Adhesive

1. High solids for bonding decorative laminates to wood products. B.
 3132 PVA Adhesive

1. High solids for bonding decorative laminates to wood products. C.

Limitations:

1. Avoid tempered hardboard, fire retardant treated materials, moisture resistant treated materials, low pressure melamine, metallic, polyester, and painted surfaces, wheatboard, and strawboard.

2.5 POSTFORMING AND PINCH ROLLING PVA ADHESIVES A.
 3000/3001 PVA Adhesive

1. High solids for bonding decorative laminate to wood products and postforming applications.
- B. Limitations:
1. Avoid tempered hardboard, fire retardant treated materials, moisture resistant treated materials, low pressure melamine, metallic, polyester, and painted surfaces, liner grade laminate to wood.

Edit Note: Refer to Tech Data sheet for specific application equipment requirements and modify article as necessary, WilsonartAdhesives.com.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Surfaces to be bonded should be clean, dry and free of any dust, loose paint, wax, moisture, dirt, grease, oil, rust, or other contaminants.

3.2 PREPARATION

- A. Allow substrates to acclimate to room temperature for 48 hours before bonding.
- B. Precondition surfacing materials and surfaces to receive surfacing materials in accordance with manufacturer's printed installation instructions. C. Moisture from condensation must be dried prior to bonding.

Edit Note: Select either 3.3, 3.4, 3.5 or all application articles to match project requirements. Make certain to review product technical literature to add any project specific requirements, WilsonartAdhesives.com.

A

3.4 GLUE SPREADER APPLICATIONS

- A. Comply with adhesive manufacturer's printed installation instructions.

3.5 HAND APPLICATIONS

- A. Comply with adhesive manufacturer's printed installation instructions.

3.6 CLEANING AND PROTECTION

- A. Clean bonded surfaces in accordance with manufacturer's care and maintenance instructions. Use manufacturer recommended solvents.



- B. Protect installed product and finish surfaces from damage during fabrication and construction.

END OF SECTION 06 1123



SECTION 06 41 00 - CUSTOM FURNITURE WOODWORK

PART 1 GENERAL

1.01 WORK INCLUDED:

Shop fabricated custom furniture woodwork, complete with hardware and accessories. Shop finish where required.

1.02 QUALITY ASSURANCE:

Perform carpentry work in accordance with the recommendations of the Millwork Standards of the Architectural Woodwork Institute (AWI) for custom grade, Type 400 construction.

1.03 REFERENCE STANDARDS:

A. FS L-P-508F - Plastic Sheet, Laminated, Decorative and Non-Decorative.

B. FS MMM-A-130A - Adhesive, Contact.

C. PS 1 - Construction and Industrial Plywood.

D. PS 20 - American Softwood Lumber Standard.

E. PS 51 - Hardwood and Decorative Plywood.

F. PS 58 - Basic Hardwood.

G. NFPA National Forest Products Association Nation Design Specification for Stress Grade Lumber and its Fastening.

1.04 SHOP DRAWINGS:

A. Submit shop drawing in accordance with Section 01340.

B. Indicate materials and wood species, component profiles, fastening, jointing details, finishes, accessories at full size. Elevations and sections at 1-1/2 inch equals 1 foot scale.

1.05 DELIVERY AND STORAGE:

A. Do not deliver carpentry items until site conditions are adequate to receive the work. Protect items from weather while in transit.

B. Store indoors, in ventilated area with constant but minimum temperature of 16 degrees C. and maximum relative humidity of 25 to 55%.

1.06 GUARANTEE/WARRANTY:

A. Provide a written guarantee in accordance with Section 01740



B. Guarantee shall provide for making good or replacing, at no cost to the Owner, cabinetwork and finish carpentry items specified herein which exhibits defects in material and workmanship within a minimum period of two years of date of Substantial Completion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Acceptable Manufacturers:

1. Kimball (Custom Armoire) 214/637-3416 Richard Gunter
2. McKenzie Galleries 713/528-1561 Mayfield McKenzie
3. Thomasville 214/783-0783 B. Pietri or Lon Rowden
4. Meinkoth Millworks 713/691-1446 Victor Meinkoth

B. Substitutions: Items of same function and performance are acceptable in conformance with Section 01340.

C. Provide and install all items as indicated on drawings, complete in all respects to function a intended.

D. Manufacturer named items are for standard of reference and do not necessarily limit supply to named manufacturer. Items of same physical size, function and performance are acceptable in conformance with Section 01340.

2.02 LUMBER PRODUCTS:

A. Softwood Lumber: PS-20, and graded in accordance with the requirements of AWI, maximum moisture content of 6% for interior work and 10% for exterior work.

2.03 SHEET MATERIALS:

A. Douglas Fir Plywood: Graded in accordance with AWI, core material of veneer.

B. Hardwood Plywood: PS 51, graded in accordance with AWI, core material of veneer, thickness(es) indicated on drawings, type of bond recommended for application.

C. Wood Particleboard: Composed of wood chips, shavings or flakes, made with high waterproof resin binders or water resistant adhesive of grade to suit application, sanded faces.

D. Wood Veneer: Cherry - Provide samples for stain selection to Architect.

2.04 ACCESSORIES:

A. Nails: size and type to suit application.

B. Bolts, Nuts, Washers, Lags, Pins and Screws: Of size and type to suit application - zinc finish in concealed location and nickel finish in exposed locations.



2.05 CABINET HARDWARE:

- A. Shelf Standards and Rests: Knappe and Vogt #83 with #161 shelf supports.
- B. Drawer and Door Pulls: Stanley #4484, US26, horizontal on drawers and vertical on doors.
- C. Catches: Stanley #41 magnetic, #45 at full height doors.
- D. Drawer Slides: Grant #329 full extension, 100 lb. rating.
- E. Hinges: Grass System 1803, 100° opening.
- F. Cabinet Locks: Stanley heavy duty.
- G. Exposed Pulls: Black finish selected by Architect from manufacturer submitted samples. Offering to include wire type, recessed type, and custom type.

2.06 FABRICATION:

- A. Fabricate cabinetwork and finish carpentry items in accordance with recommendations of AWI custom grade construction. When necessary to cut and fit on site, make material with ample allowance for cutting. Provide trim for scribing and site cutting.
- B. Cabinetwork Doors: Minimum 3/4 inch thick and of type construction indicated on Drawings.
- C. Use exposed fastening devices only when unavoidable. Arrange neatly, use nickel plated fasteners with finishing washers.
- D. Shop assembly cabinetwork and finish carpentry items for delivery to site in sizes easily handled and to ensure passage through building openings.

2.07 PREPARATION FOR FINISHING:

- A. Seal internal surfaces of drawers with one coat of shellac. Brush apply only.
- B. Seal surfaces in contact with cementitious materials.

2.07 PREPARATION FOR FINISHING: (CONTINUED)

- C. Provide cutouts for inserts, appliances, outlet boxes, and other fixtures and fittings. Verify location of cutouts from on-site dimensions. Seal contact surfaces of cutouts.

END OF SECTION



DIVISION 07 – THERMAL AND MOISTURE PROTECTION

**SECTION 07 41 13
 STANDING SEAM METAL ROOFING**

SPEC WRITER NOTES:

1. Use this section only for NCA projects.
2. Use for roofing sloped 1 in 4 (3 in/ft) or greater.
3. Delete between //____// if not applicable to project. Also delete any other item or paragraph as required and renumber the paragraphs.

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the installation of batten seam copper roofing.

1.2 RELATED WORK

- A. Sealant: Section 07 92 00, JOINT SEALANTS.
- B. Fascia and Trim: 07 60 00 Flashing and Sheet Metal

1.3 INSTALLATION REQUIREMENTS

Install in accordance with SMACNA Architectural Sheet Metal Manual except as otherwise shown or specified.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only:
- B. American Society for Testing and Materials (ASTM):
 - A792/A792M-09 Standard Specifications for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
 - B32-08 Standard Specification for Solder Metal
 - C920-08 Standard Specifications for Elastomeric Joint Sealants
 - D226-06..... Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Weatherproofing
 - D227-03..... Standard Specification for Coal-Tar-Saturated Organic Felt Used in Roofing and Waterproofing
 - D4397-09..... Standard Specifications for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
 - E1514-98 (2003) Standard Specification for Structural Standing Seam Steel Roof Panel Systems
- C. Federal Specification (Fed. Spec.):

UU-B-790A INT AMD Building Paper, Vegetable Fiber: (Kraft, Waterproof, Water Repellent and Fire Resistant) D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual 2003

PART 2 - PRODUCTS

SPEC WRITER NOTE:

Make material requirements agree with applicable requirements specified in the referenced Applicable Publications. Update and specify only that which applies to the project.

2.1 METAL ROOF PANEL

- A. Aluminum-Zinc Alloy Coated Sheet Steel
- B. ASTM E1514
- C. Factory formed metal roof panels designed to be field assembled by lapping and interconnecting raised side edges of adjacent panels with joint type indicated, and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for a weathertight installation.
- D. Vertical rib, snap joint, standing seam metal roof panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels and snapping panels together.
- E. Panel Coverage: // 304 mm (12 inches) // 406 mm (16 inches) // 608 mm (24 inches) //

2.2 SEALANTS

- A. ASTM C920
- B. Type, Grade, and Class as recommended in writing by the manufacturer.

2.3 SEALANT TYPE

- A. Pressure sensitive, 100% solids, Gray Polyisobutylene compound with release-paper backing.
- B. 12 mm (1/2 inch) wide x 3mm (1/8 inch) thick.

2.4 UNDERLAYMENT

- A. Felts: ASTM D226, Type I or ASTM D227
- B. Polyethylene sheet: 0.38 mm (15 mil) ASTM D4397

2.5 FASTENERS

- A. Self drilling, or self tapping zinc plated hex head carbon-steel screws with neoprene washer or stainless steel cap.
- B. ASTM B32: Flux type and alloy composition as required for use with metals to be soldered.

2.6 BUILDING PAPER

- A. Fed. Spec. UU-B-790, Type I, Grade C.

2.7 FINISHES

- A. Factory finished complying with SMACNA's recommendations for applying and designating finishes
- B. Exterior Finish: Pluoropolymer
- C. Color: As indicated

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of work.
 - 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
- B. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
- B. Install fascia and trim to comply with requirements specified in Division 7 Section "Flashing and Sheet Metal"
- C. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written recommendations.
 - 1. Soffit Framing: Install furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 METAL ROOF PANEL INSTALLATION, GENERAL

- A. General: Provide metal roof panels of full length from eave to ridge, unless otherwise indicated or restricted by shipping limitations. Anchor metal roof panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Field cutting of metal roof panels by torch is not permitted.
 - 2. Install panels perpendicular to purlins.
 - 3. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Pre-drill panels.
 - 4. Provide metal closures at peaks, rake walls and each side of ridge and hip caps.

5. Flash and seal metal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 6. Locate and space fastenings in uniform vertical and horizontal alignment.
 7. Install ridge and hip caps as metal roof panel work proceeds.
 8. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 9. Lap metal flashing over metal roof panels to allow moisture to run over and off the material.
- B. Fasteners:
1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.
1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.

3.4 FIELD-ASSEMBLED METAL ROOF PANEL INSTALLATION

- A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
1. Install clips to supports with self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
- B. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.
1. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings
- C. Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings



3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal roof panel units within installed tolerance of 6 mm in 6 m (1/4 inch in 20 feet) on slope and location lines as indicated and within 3 mm (1/8 inch) offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

--- E N D ---



SECTION 07 42 13.16 - METAL PLATE WALL PANELS

GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

SUMMARY

Section includes metal plate wall panels.

Related Sections:

Division 05 Section "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal wall panels.

Division 07 Section "Sheet Metal Flashing and Trim" for field-formed flashings and other sheet metal work not part of metal wall panel assemblies.

Division 07 Section "Weather Resistive Barrier" for Air and Moisture barrier required as part of the metal wall panel assembly.

DEFINITION

Metal Plate Wall Panel Assembly: Metal plate wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weather tight wall system based on AAMA - CW-RS - 1-04 The Rain Screen Principle and Pressure Equalized Wall Design.

PERFORMANCE REQUIREMENTS

General Performance: Metal plate wall panel assemblies shall comply with performance requirements without failure due to defective manufacturing, fabrication, installation, or other defects in construction. Design, fabricate, and erect a pressure equalized "rainscreen" aluminum wall panel system to meet the requirements of **AAMA 508-7** Voluntary Test Method and Specifications for Pressure Equalized Rain Screen Wall Cladding Systems, specifically as follows.

- A. Pressure Equalization: ASTM E1233 Cyclic Static Air Pressure Differential Testing; Positive pressure loading to 1200 pa. (25psf) for 100 three second cycles.
- B. Air Leakage: Not more that 0.06 (cfm)/sf of wall area when tested at 6.24 psf in accordance with ASTM E283.
- C. Water Penetration ; Static: No water infiltration under static pressure when tested in accordance with ASTM E331 at a differential of 10% of inward acting design load, 15.00 psf min. after 15 minutes.
- D. Water Penetration; Dynamic: AAMA 501.1 Dynamic Water Test at a minimum of 300 Pa (6.24 psf.)



- E. Structural: Provide systems that have been tested in accordance with ASTM E330 and have been certified to be without permanent deformation or failures of structural members.

SUBMITTALS

Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal plate wall panel and accessory.

Shop Drawings: Show fabrication and installation layouts of metal plate wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work.

Accessories: Include details of the following items, at a full scale.

Manufacturers Standard Extrusions.

Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

Metal Plate Wall Panels: 2"x3" Sample Chips.

Coordination Drawings: Exterior elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

Metal plate wall panels and attachments.

Girts

Wall-mounted items including doors, windows, louvers, and lighting fixtures.

Penetrations of wall by pipes and utilities.

Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified independent testing agency, for each product.

Maintenance Data: For metal plate wall panels to include in maintenance manuals.

Warranties: Sample of Manufacturers standard warranty

QUALITY ASSURANCE

Installer Qualifications: An employer of workers trained and approved by manufacturer.

Source Limitations:

1. Source Limitations: Obtain each type of metal plate wall panel from single source and single manufacturer.



2. Installer: Pre-Qualified Company specializing in performing the work of this Section shall install the system in strict compliance with the written "Installation Guide."

Obtain each type of metal plate wall panel from single source from single manufacturer.

Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

Build mockup of typical wall panels and typical details as shown on Drawings or as directed by Architect, at a minimum include 4 panels indicating a four-way joint of the panels by full thickness, including supports, attachments, and accessories. .

Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

Pre-installation Conference:

Meet with Owner, Architect, and metal plate wall panel Installer, metal plate wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects panels including installers of doors, windows, and louvers.

Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

Review methods and procedures related to metal plate wall panel installation, including manufacturer's written instructions.

Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.

Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal plate wall panels.

Review temporary protection requirements for metal plate wall panel assembly during and after installation.

DELIVERY, STORAGE, AND HANDLING

Deliver components, metal plate wall panels, and other manufactured items so as not to be damaged or deformed. Package panels for protection during transportation and handling.

Store and handle in strict compliance with manufacturers instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

Store and erect metal plate wall panels in a manner to prevent bending, warping, twisting, and surface damage. Do not store panels horizontally. Always store vertically with top of panel down.



Store covered with suitable weather tight and ventilated covering. Store panels to ensure dryness, with positive slope for drainage of water. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

Remove strippable protective covering on metal plate wall panel prior to installation.

PROJECT CONDITIONS

Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal plate wall panels to be performed according to manufacturer's written instructions and warranty requirements.

Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal plate wall panel fabrication and indicate measurements on Shop Drawings.

COORDINATION

Coordinate metal plate wall panel assemblies with rain drainage work, flashing, trim, and construction of studs, soffits, and other adjoining work.

WARRANTY

Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal plate wall panel assemblies that fail in materials or workmanship within specified warranty period.

Failures include, but are not limited to, the following:

Structural failures, including rupturing, cracking, or puncturing.

Deterioration of metals and other materials beyond normal weathering.

Warranty Period: One year from date of Substantial Completion.

Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish of metal plate wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

Finish Warranty Period: 10 years from date of Substantial Completion.

PRODUCTS

PANEL MATERIALS

Aluminum Plate: Alloy and temper as recommended by manufacturer for application and in strict adherence to Manufacturers "Design Guide". Dri-Design® Wall Panel System of 3003-H14 Aluminum. Thickness shall be .080", .063" or .050" per the requirements of the project or unless otherwise specified.

MISCELLANEOUS METAL FRAMING



Subgirts: 7/8" hat section, C- or Z-shaped sections with Gauge per project requirements, Minimum 14ga. flat strap, minimum 20ga. Nominal thickness.

MISCELLANEOUS MATERIALS

Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated.

Panel Fasteners: Suitable fasteners designed to withstand design loads. Stainless steel fastener with a minimum 7/16" diameter head and neoprene washer.

METAL PLATE WALL PANELS

Metal Plate Wall Panels: Provide factory-formed, metal plate wall panels fabricated from single sheets of metal formed into a Dri-design dry-joint pressure equalized rainscreen system with interlocking gutter and drainage system integral to the panel with single horizontal attachment to complete a dry-joint rainscreen assembly. The use of secondary drainage channels, brackets, support pins, joint sealants or gaskets to manage the drainage of the system are not allowed.

Product Basis for Design: Panels shall be manufactured by **Dri-Design, Holland, Michigan. (616) 355-2970**
Subject to compliance with manufacturers requirements, provide the following

Dri-design Painted Aluminum Wall Panels

Material: Tension-leveled, smooth 3003-H14 Aluminum. Thickness of shall be **(.080", .063", .050")**

Panel Depth: 1.25" **(panel depth can be specified in a range from 1.25" – 4" depending on material)**

Exterior Finish: Kynar resin finish as manufactured by Valspar, PPG, Akzo Noble or equivalent.

Color: As indicated by manufacturer's designations selected by Architect.

ACCESSORIES

Metal Plate Wall Panel Accessories: Provide components required for a complete metal plate wall panel assembly including trim, copings, fascia, mullions, sills, corner units, flashings, and similar items. Match material and finish of panels unless otherwise indicated.

Manufacturers Standard Extrusions: Provide integral drainage system and manufactures standard extrusions at termination of dissimilar materials.

Flashing and Trim: Same material, finish, and color as adjacent metal plate wall panels, minimum 0.040 inch thick unless otherwise indicated.

Weather Resistive Barriers: Provide a weather barrier with performance characteristics for Air Penetration , Water Vapor Transmission and Water Penetration Resistance. Weather Barriers can be climate specific. Consult Div. 7 Weather Resistive Barriers for specific requirements of the project.

FABRICATION



General: Panels shall be factory fabricated and finished by manufacturer to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

GENERAL FINISH REQUIREMENTS

Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

ALUMINUM FINISHES **(pick one, or applicable)**

Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Four-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat and clear coats. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Mica Fluoropolymer: AAMA 2605. 2-coat Fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Color Anodic Finish: AAMA 611-98, Class I, 0.7 mills.

EXECUTION

EXAMINATION

Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal plate wall panel supports, and other conditions affecting performance of the Work.

Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal plate wall panel manufacturer.

Verify that weather-resistant sheathing paper has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

Examine roughing-in for components and systems penetrating metal plate wall panels to verify actual locations of penetrations relative to seam locations of panels before installation.

Proceed with installation only after unsatisfactory conditions have been corrected.



PREPARATION

Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous metal plate wall panel support members and anchorage according to ASTM C 754 and panel manufacturer's written instructions.

METAL PLATE WALL PANEL INSTALLATION

General: Install metal plate wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels according to manufacturer's pressure equalized rainscreen installation method in strict accordance to the manufacturer's installation guidelines. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.

Commence metal plate wall panel installation

Shim or otherwise plumb substrates receiving metal plate wall panels.

Flash and seal metal plate wall panels with weather closures at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed.

Install flashing and trim as metal plate wall panel work proceeds.

Provide weather tight escutcheons for pipe and conduit penetrating exterior walls.

Fasteners:

Aluminum Plate Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal plate wall panel manufacturer.

Attachment System, General: Install attachment system required to support metal plate wall panels and to provide a complete weather tight wall system, including subgirts, manufacturer's extrusions, flashings and trim.

Include attachment to supports and extrusion trims at dissimilar-materials

Do not apply sealants to joints unless otherwise indicated on Drawings or Manufacturers Shop Drawings.

Include manufactures starter extrusion at base course and at cut panel locations.

Rainscreen-Principle Installation: Provide manufacturer's standard pressure-equalized, rainscreen-principle system factory-formed, metal plate wall panels fabricated from single sheets of metal formed with interlocking gutter and drainage system integral to the panel with single horizontal attachment to complete dry-joint rainscreen assembly. The use of secondary drainage channels, brackets, support pins, joint sealants or gaskets to manage the drainage of the system are not allowed. Attach metal plate wall panels in a progressive interlocking method by engaging bottom of panel in top of previous panel working left to right.

Install metal plate wall panels with single top attachment in pre-punched holes to allow individual panels to free-float. Do not fasten perimeter of panel or compromise internal gutter.



Do not apply sealants to joints unless otherwise indicated on Drawings at dissimilar materials.

ACCESSORY INSTALLATION

General: Install accessories with positive anchorage to building and weather tight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

Install components required for a complete metal plate wall panel assembly including trim, copings, corner and standard extrusion covers, flashings and similar items.

Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

Weather Resistive Barrier: Install Air & Moisture barrier behind metal plate panels over substrate according to the requirements specified in Division 07 Section "Weather Resistive Barrier".

ERECTION TOLERANCES

Installation Tolerances: Shim and align metal plate wall panel units within installed tolerance of 1/4 inch in 20 feet, non-cumulative, on level, plumb, and location lines as indicated.

CLEANING

On completion of metal plate wall panel installation, clean finished surfaces as recommended by panel manufacturer.

After metal plate wall panel installation, clear weep holes and drainage channels of obstructions, dirt.

Replace metal plate wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION



DIVISION 08 – OPENINGS

SECTION-08 41 00- STANDARD WOOD FOLDING SYSTEM

NanaWall® WD66

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Engineered sliding/folding wood and glass door system, including wood/aluminum frame, threshold, wood panels, sliding/folding and locking hardware, splines, weather stripping, glass and glazing; designed to provide an opening glass wall, with sizes and configurations as shown on drawings and specified herein, with NanaWall® WD66, the Standard Wood Framed Folding System as supplied by NANA WALL SYSTEMS, INC.

1.02 REFERENCES

A. American Architectural Manufacturers Association (AAMA):

1. AAMA 1303.5, Voluntary Specifications for Forced Entry Resistant Aluminum Sliding Glass Doors. B. American National Standards Institute (ANSI):

1. ANSI Z97.1, Safety Performance Specifications and Methods of Test for Safety Glazing Material Used In Buildings.

C. American Society for Testing and Materials (ASTM):

1. ASTM E 283, Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

2. ASTM E 330, Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

3. ASTM E 547, Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.

D. Consumer Product Safety Commission (CPSC):

1. CPSC 16CFR-1201, Safety Standard for Architectural Glazing Materials. E. National Fenestration Rating Council (NFRC):

1. NFRC 100, Procedure for Determining Fenestration Product Thermal Materials.



2. NFRC 200, Procedure for Determining Solar Heat Gain Coefficient.

1.03 SUBMITTALS

- A. Detail Drawings: Indicate dimensioning, direction of swing, configuration, swing panels, typical head jamb, side jambs and sill details, type of glazing material and handle height.
- B. Product Data: Manufacturer's literature including independently tested data listing performance criteria and Owner's Manual with installation instructions.
- C. Contract Closeout Submittal: Submit Owner's Manual from manufacturer. Identify with project name, location and completion date, type and size of unit installed.

1.04 QUALITY ASSURANCE

A. Manufacturer: Provide complete, precision built, engineered, pre-fitted unit by a single source manufacturer with at least 25 years experience in providing folding/sliding door systems for large openings in the North American market.

1. The manufacturer must have a quality management system registration to the ISO 9001: 2008 standard.
2. The manufacturer must have an environmental management system registration to the ISO 14001: 2005 standard.

B. Performance Requirements: Provide from manufacturer that has independently tested typical units. Testing results to include air infiltration in accordance with ASTM E 283, water penetration in accordance with ASTM E 547, structural loading in accordance with ASTM E 330, and forced entry in accordance with AAMA 1303.5 and CAWM 300-96.

SPECIFIER'S NOTE: Air infiltration and water penetration testing results can only be applicable if the unit matches the test unit in the direction of opening and the type of sill. Structural load testing results are only applicable for the test unit size with top and bottom reinforced locking points and type of mounting. (Comparative analysis charts published by manufacturer show which panel sizes (if any) would meet structural loading design pressures specifically required for the project. Check for limitations on the use of these charts in the jurisdiction of the project). Forced entry testing results are only applicable for the test unit type of locking. See manufacturer's latest published data.

C. Thermal Performance U factor: Unit to be rated, certified and labeled in accordance with NFRC 100, shown in manufacturer's latest published data for the glazing, sill and direction of opening specified.

D. Solar Heat Gain Coefficient: Unit to rated, certified and labeled in accordance with NFRC 200, shown in manufacturer's latest published data for the glazing, sill, and direction of opening specified.

SPECIFIER NOTE: If desired, Energy Star ratings can be achieved by the use of proper glass with the unit. See NanaWall's Performance data for details.



E. Installer Qualifications: Installer experienced in the installation of manufacturer's products or other similar products for large openings. Installer to provide reference list of at least 3 projects of similar scale and complexity successfully completed in the last 3 years.

1.05 WARRANTY

A. Provide manufacturer's standard warranty against defects in materials and workmanship.

B. Warranty Period: Ten years for rollers and for seal failure of insulated glass supplied. For all other components, one year (two years if unit is installed by manufacturer's certified trained installer) from date of delivery by manufacturer.

1.06 SITE CONDITIONS, DELIVERY, STORAGE AND HANDLING

A. In addition to general delivery, storage and handling requirements specified in Section 01600, comply with the following:

1. Deliver materials to job site in sealed, unopened cartons or crates. Protect units from damage. Store material under cover, protected from weather and construction activities.

B. Condition wood components to average prevailing relative humidity before installation. C. Do not subject wood components to extreme nor rapid changes in heat or humidity.

D. Do not use forced heat to dry out building.

E. Store flat in dry, well ventilated area out of direct sunlight.

PART 2 – PRODUCTS

2.01 SUPPLIER

A. NANA WALL SYSTEMS, INC.

100 Meadow Creek Drive

Corte Madera, CA 94925

Toll Free: (800) 873-5673

Telephone: (415) 383-3148

Fax: (415) 383-0312

Website: www.nanawall.com

Email: info@nanawall.com

2.02 MATERIALS



A. Frame and Panels: From manufacturer's standard profiles, provide head track, side jambs, panels, and glazing stops with dimensions shown on drawings.

1. Provide panels with:

Standard one lite

[OR with horizontal mullion(s) at specified height(s) from the bottom of the panel]

[OR with simulated divided lites in pattern as shown on drawings].

2. Provide stile and rail width / depth of

3 1/16" (78 mm) / 2 5/8" (66 mm)

[OR 3 3/4" (95 mm) / 2 5/8" (66 mm)] [OR 4 3/4" (120mm) / 2 5/8" (66 mm)]

[OR 3 1/16" (78 mm) / 3 1/6" (78 mm) for triple glazing]

3. Provide standard bottom rail [OR manufacturer's standard higher bottom rail with height specified between 5" and 12"].

4. Type of Wood: Solid, three layer, cross-grained, kiln dried

Douglas fir - PEFC [OR European pine] [OR meranti]

[OR western hemlock] [OR Spruce]

[OR European oak] [OR sapeli mahogany]

[OR cherry (interior applications only)] [OR maple (interior applications only)] [OR beech (interior applications only)]

[OR laminated bamboo (interior applications only.)]

[OR other wood as selected] with matching solid wood glazing stops. [OR FSC wood on request]

5. Construction of wood panels to include close tolerance mortise and tenon, glued and pinned corners.

6. Wood Finish: Finishes to be water based, opened pored

Clear sanding sealer for stain

[OR base coat applied for paint]

SPECIFIER'S NOTE: Before installation, the unit must be field finished with at least two coats for a final protected finish.

7. Aluminum Extrusion: Extrusions with nominal thickness of .078" (2.0 mm). Alloy specified as AlMgSi0.5 with strength rated as 6063-T5 or F-22 (European standard). Anodized conforming to AAMA 611.98.



B. Glass:

1. Provide manufacturer's standard glass and dry glazing with EPDM gaskets and glass stops on the inside only, which are fixed with hidden nails. Glass to comply with safety glazing requirements of ANSI Z97.1 and CPSC 16CFR 1201.

15/16" (24 mm) insulating clear safety

[OR 15/16" (24 mm) insulating argon filled Low-E safety]

[OR 15/16" (24 mm) insulating krypton filled Heat Mirror TC88 safety] [OR 1 1/2" (38 mm) triple glazed insulating argon filled Low-E safety] [OR 1/4" (6 mm) tempered]

[OR 1/4" (6 mm) laminated]

[OR other glass available from manufacturer].

2. For insulated units, provide manufacturer's standard gray [OR dark bronze] glass spacers. Provide without capillary tubes [OR with capillary tubes]. C. Locking Hardware and Handles:

1. Main entry panel:

On the main entry panel for models with a pair of swing panels, provide manufacturer's standard lever handles on the inside and outside, a Schlage compatible lock set with lockable latch, multi-point locking with a dead bolt and rods at the top and bottom on primary panel. Rods to be concealed and not edge mounted. After turn of key or thumb turn, depression of handles withdraws latch. Lifting of

handles engages rods and turn of key or thumb turn engages deadbolt and operates lock. On the

secondary swing panel, provide matching dummy lever handles on both sides and concealed flush bolts that operate the rods at the top and the bottom for the secondary swing panel.

Stainless steel lever handles in a titanium black finish

[OR stainless steel lever handles in a brushed satin finish] [OR oil rubbed bronze solid brass lever handles]

[OR satin nickel solid brass lever handles]

[OR on the main entry panel for models with a swing panel, provide manufacturer's standard lever handles on the inside and outside, a Schlage compatible lock set with lockable latch, multi-point locking with a dead bolt and rods at the top and bottom on primary panel only. Rods to be concealed and not edge mounted. After turn of key or thumbturn, depression of handles withdraws latch. Lifting of handles engages rods and turn of key or thumb turn engages deadbolt and operates lock. If there is a secondary swing panel, provide two point locking with flat handles on inside only for the secondary swing panel.]

Stainless steel lever handles in a titanium black finish

[OR stainless steel lever handles in a brushed satin finish] [OR oil rubbed bronze solid brass lever handles]



[OR satin nickel solid brass lever handles]

[OR on the main entry panel for models with a swing panel, provide manufacturer's push/pull handles with separate lock set and dead bolt.

Push-pull handles in a brown nylon finish

[OR push-pull handles in a gray nylon finish]

SPECIFIER'S NOTE: This option is recommended with a door closer, but note that in order to slide the swing panel, the door closer will need to be disengaged if the swing panel is not attached to a side jamb.]

[OR on the main entry panel for models with a swing panel, no hardware or locking to be provided by the manufacturer, but with field installed panic device by others.]

[OR on both entry panels for models with a pair of swing panels, no hardware or locking to be provided by the manufacturer, but with field installed panic devices on both panels by others.]

[OR on main entry pair of panels on inswing models without a swing panel, provide manufacturer's standard L-shaped handle on the inside, flat handle on the outside and lock set with profile cylinder. Operation of lock set is by turn of key from the outside and with a thumbturn from the inside with a two point locking hardware operated by 180° turn of the handle.]

Stainless steel L shaped handles in a titanium black finish

[OR stainless steel L shaped handles in a brushed satin finish] [OR L shaped handles in a brown nylon finish]

[OR L shaped handles in a gray nylon finish]

[OR on main entry pair of panels on outswing models without a swing panel, provide manufacturer's standard flat handle on the inside and on the outside and a lock set with a profile cylinder. Operation of lock set is by turn of key from the outside and from the inside with a two point locking hardware operated by 180° turn of the handle.

SPECIFIER'S NOTE: Key operation from the inside may not meet egress requirements.]

[OR on main entry panel, provide manufacturer's standard flat handle on inside only with concealed two point locking hardware operated by 180 degree turn of handle.

SPECIFIER'S NOTE: Note that with this option, the main entry panel is operable from inside only and that there is no latch.]

2. On all other secondary swing panels and pairs of folding panels, provide manufacturer's standard flat handles [OR removable custodial handles] and concealed two point locking hardware operated by 180 degree turn of handle between each pair. Face applied flush bolt locking will not be allowed.

3. Flat handle finish:

Stainless steel in a titanium black finish



[OR stainless steel in a brushed satin finish] [OR dark brown powder coated]

[OR silver gray powder coated]

4. Provide handle height centered at 41 3/8" [OR as specified] from bottom of panel.

5. Aluminum locking rods with fiber glass reinforced polyamide end caps at top and bottom. Rods to have a stroke of 15/16" (24 mm).

6. If there are more than one unit, keyed alike [OR keyed differently].

D. Sliding/Folding Hardware: Provide manufacturer's standard combination sliding and folding hardware with top, bottom tracks and threshold. All running carriages to be with sealed, self-lubrication, ball bearing multi-rollers. Surface mounted hinges and running carriages will not be allowed.

1. For each pair of folding panels:

For top hung system WD66/o, provide cardanic, independently suspended, four wheeled coated with fiber glass reinforced polyamide upper running carriage and lower guide carriage.

[OR for floor mounted system WD66/u, provide upper guide carriage and lower running carriage with four vertical stainless steel wheels and two horizontal wheels. The vertical wheels to ride on stainless steel guide track covers over the full length of sill track. Carrying capacity of lower running carriage to be 220 lbs. (100kgs)]

2. Threshold: Provide thermally broken with polyamide

Cover plate over the sill will not be allowed

SPECIFIER'S NOTE: Note that this option is not available with the floor mounted WD66/u.

3. Provide manufacturer's standard clear anodized [OR dark bronze anodized] aluminum hinges and spine on edge of panel. For structural strength, hinges to be connected to spine and not directly into wood. Provide stainless steel security hinge pins with set screws.

4. Adjustment: Provide folding/sliding hardware capable of specified amount of compensation and adjustments without needing to remove panels from tracks, in width, 1/8" (3 mm) per hinge and in height, 1/4" up and down.

E. Weather stripping: Provide manufacturer's standard double layer EPDM or brush seals with a two layer polyamide fin at both the inner and outer edge of door panels or on frame for sealing between panels and between panel and frame. Single layer weather stripping will not be allowed.

2.03 FABRICATION

A. Use solid, three layer, cross grained frame and panel profiles, hinges and spines, sliding and folding hardware, locking hardware and handles, threshold and track, glass and glazing and weather stripping as

specified herein to make a folding glass wall. Factory pre-assemble as is standard for manufacturer and ship with all components and installation instructions.

B. Sizes and Configurations: See drawings for selected custom dimensions within maximum frame sizes possible as indicated in manufacturer's literature. See drawings for selected number of panels and configuration. Swing/stacking direction: Inward [OR outward] opening unit. On configurations with a pair of swing panels, looking from inside, primary swing panel on the left [OR right]

2.04 ACCESSORIES (Edit for project requirements.)

A. Provide the NanaScreen™, a series of vertical, collapsible, pleated screen panels. Provide pleated screen material with floor tracking chain with ¼" (5 mm) floor track. See drawings for selected number of panels and configuration.

Provide aluminum top track, side jambs, and vertical struts: White powder coated

[OR clear anodized]

[OR dark bronze anodized]

[OR powder coated select from range of RAL powder coated finishes available from manufacturer].
NanaScreen™ installation within opening [OR extended beyond opening]

B. Provide other side lites, transoms, or single or double doors as per drawings provided.

PART 3 – EXECUTION

3.01 ERECTION

A. Because of the large dimensions involved and the weight and movement of the panels, verify the structural integrity of the header such that the maximum deflection with live and dead loads is limited to be the lesser of L/720 of the span and 1/4". Structural support for lateral loads (both wind load and eccentric load when the panels are stacked open) must be provided. It is recommended that all building dead loads be applied to the header prior to installing the NanaWall. If so and if a reasonable amount of time has been allowed for the effect of this dead load on the header, then only the building's live load can be used to meet the above requirements of L/720 or 1/4". If not, both the dead and live loads need to be considered.

B. Examine surfaces of openings and verify dimensions; verify rough openings are level, plumb, and square, with no unevenness, bowing, or bumps on the floor.

C. Installation of units constitutes acceptance of existing conditions.

3.02 INSTALLATION

A. Install frame in accordance with manufacturer's recommendations and installation instructions. Properly flash and waterproof around the perimeter of the opening.



B. Installer to provide appropriate anchorage devices and to securely and rigidly fit frame in place, absolutely level, straight, plumb and square. Install frame in proper elevation, plane and location, and in proper alignment with other work.

C. If necessary, provide drain connections from lower track.

D. Install panels, handles and lock set in accordance with manufacturer's recommendations and installation instructions.

E. If necessary, adjust hardware for proper operation.

F. Finishing: Field finish under Section 09900 -Painting; seal and finish promptly after installation and prior to exposure to weather in accordance with manufacturer recommendations.

G. Accessories: Screens; install in accordance with screen manufacturer's recommendations and installation instructions.

END OF SECTION



DIVISION 09 – FINISHES

SECTION 09300 – TILE

PART 1 – GENERAL

1.01 SUMMARY

- A. Extent of Work: Tile work is indicated on Contract drawings and schedules.

Tile includes ceramic surfacing units made from clay or other ceramic materials.

- B. Types: Tile work in this section includes the following:

1. Interior glazed ceramic tile for interior walls where scheduled.
2. Unglazed porcelain interior floor tile where scheduled.
3. Ceramic tile trim for floors and base.

- C. Related Sections: Refer to the following sections for related work:

1. Section 03300, "Cast-in-Place Concrete" for concrete surfaces.
2. Section 07900 "Joint Sealants" for sealing of expansion, contraction, control and isolation joints in tile surfaces.
3. Section 09250, "Gypsum Drywall" for cementitious barker units installed on substrate for ceramic tile.

1.02 REFERENCES

- A. American National Standards Institute (ANSI)

A108.5 Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar

A118.1 Dry-Set Portland Cement Mortar

A118.4 Latex-Portland Cement Mortar

A137.1 Ceramic Tile

- B. American Society for Testing and Materials (ASTM)

C171 Specification for Sheet Materials for Curing Concrete

C373 Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired White Ware Products

C482 Test Method for Bond Strength of Ceramic Tile to Portland Cement



C648 Test Method for Breaking Strength of Ceramic Tile

C650 Test Method for Resistance of Ceramic Tile to Chemical Substances

C1026 Test Method for Measuring the Resistance of Ceramic Tile to Freeze-Thaw Cycling

C. National Tile Promotion Federation

D. Ceramic Tile Institute

E. Tile Council of America (TCA)

W212 Handbook for Ceramic Tile Installation

W213 Handbook for Ceramic Tile Installation

W214 Handbook for Ceramic Tile Installation

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical information and installation instructions for materials required.

B. Asbestos Free and Lead Free Paint Certification: Submit manufacturer's written certification that all materials are free of asbestos and lead paint.

C. Samples for Initial Selection Purposes: Submit manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures, and patterns available for each type of tile indicated. Include samples of grout and accessories involving color selection.

D. Certified Test Reports: Submit certified test reports from a qualified independent testing laboratory evidencing compliance of tile and tile setting products with requirements specified, based on comprehensive testing of current products. Include in reports testing laboratory's interpretation of test results relative to specific requirements.

E. Shop Drawings: Submit shop drawings indicating tile patterns if applicable and locations and widths of control and expansion joints in tile surfaces.

F. LEED Submittals:

1. Credit EQ 4.1: Manufacturers' product data for adhesive and sealant, including a printed statement of VOC content.

1.04 QUALITY ASSURANCE

A. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

B. Guarantee: All floor tile to be guaranteed by manufacturer for 15 years against undue glaze wear caused by pedestrian foot traffic.



C. Qualifications of Installers: Ceramic tile is to be installed in a workmanlike manner by an installer with not less than three (3) years experience in similarly sized commercial work.

1.05 DELIVERY, STORAGE, AND HANDLING

Deliver and store packaged materials in manufacturer's original unopened containers with seals unbroken and labels intact until time of use. Store materials off ground and under cover to prevent damage or contamination to materials by water, freezing, foreign matter or other causes. Promptly remove from site any materials which show evidence of damage, and immediately make all replacements necessary.

1.06 PROJECT CONDITIONS

A. Environmental: Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Maintain temperatures at 50° Fahrenheit (10° Celsius) or more in tiled areas during installation and for seven (7) days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

C. Tile installer must examine substrate and environmental conditions under which ceramic tile is to be installed. Notify Sandia Delegated Representative (SDR) in writing regarding any conditions which will interfere with the completion of the work.

1.07 MAINTENANCE AND EXTRA MATERIALS

Extra material will not be required upon project completion if the tile provided and installed on the project is from the manufacturer's standard product line. Extra material will be required if the tile provided and installed is of a unique or special run. Upon project completion, deliver required extra tile, trim units, composition, color, pattern, and size of each type installed to SDR. Materials should be packaged with protective covering and identified with labels. Furnish not less than 5% maintenance stock of total product installed for each type, color, pattern, and size of tile products installed.

PART 2 - PRODUCTS

2.01 STANDARDS

A. General: All tile products, grouts, trims, mortars, cleaners, thinset, etc. shall be checked for compatibility with substrate and adjacent materials by Contractor prior to purchasing material.

B. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated. Furnish tile complying with "Premium Grade" requirements unless otherwise indicated.

C. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced for setting and grouting.

D. Color, Textures and Patterns: As indicated on drawings and schedules; for products listed and requiring selection of colors, surface textures or other appearance characteristics, as selected at time of submittals.



E. Accessories: Provide tile trim and accessories which match color and finish of adjoining flat tile if not as selected at time of submittals.

F. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer unless another mounting method is indicated.

2.02 MANUFACTURERS

Approved manufacturers include, but are not limited to, the following:

Dal-Tile Corporation

American Olean Tile Company, Inc.

Monarch Tile Manufacturing, Inc.

Winburn Tile Manufacturing Company

Summitville Tiles, Inc.

2.03 TILE PRODUCTS

A. Glazed Wall Tile: Where indicated on Contract documents, provide Premium Grade tile in compliance with ANSI A137.1 and suitable for use on countertops, bathroom walls, and general commercial use and complying with the following requirements:

1. Composition: Glazed wall tile

a. Porcelain Tile: Provide porcelain tile only when noted elsewhere in the Contract documents.

b. **Ceramic Mosaic Tile: Provide ceramic mosaic tile only when noted elsewhere in the Contract documents.** 2. Nominal Face Dimensions: If not indicated on drawings or schedules, provide manufacturer's standard size.

3. Nominal Thickness: 5/16 inch (7.94 mm) except ceramic mosaic tile shall be 1/4 inch (6.35 mm).

4. Grout Dimension: 1/8 inch (3.18 mm).

5. Wearing Surface: Smooth.

6. Back Mounting: Manufacturer's standard back-mounted sheets are allowed provided they do not interfere with any patterns indicated on Contract Documents. Contractor shall notify SDR if manufacturer's mounting prohibits installation of any patterns indicated on Contract documents at time of submittal.

7. Trim Units: Required.

B. Floor Tile: Where indicated on Contract documents, provide Premium Grade tile suitable for use on bathrooms, entries, and general use floor areas and complying with the following requirements:

1. Composition: Unglazed porcelain.
2. Nominal Face Dimensions: If not indicated on drawings or schedules, provide manufacturer's standard size with square edges.
3. Nominal Thickness: 5/16 inch (7.94 mm).
4. Group Dimensions: 1/4 inch (6.35 mm).
5. Wearing Surface: Slip-resistant grid or sand blasted finish.
6. Water Absorption: Less than 1/2 percent per ASTM C373.
7. Frost Resistance: Yes, per ASTM C1026.
8. Chemical Resistance: Tile unaffected per ASTM C650.
9. Break Strength: 250 pounds minimum per ASTM C648.
10. Bond Strength: 50 psi minimum per ASTM C482.

11. Trim Units: Required.

C. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:

1. Size: Size shall be as coordinated with sizes and coursing of adjoining flat tile.
2. Shapes: Shapes shall be as follows:

a. Base: Coved.

b. External Corners: Surface bullnose.

c. Internal Corners: Field-buttet square corners, except use internal cove and cap angle pieces designed to member with stretcher shapes.

2.04 SETTING MATERIALS

A. Latex-Portland Cement Mortar: Provide product complying with ANSI A118.4 and the following requirement for composition:

Prepackaged dry mortar mix incorporating dry polymer additive in the form of a re-emulsifiable powder to which only water is added at job site.

B. Thin-Set Portland Cement Mortar: Where thin-set Portland cement mortar applications are required, use the following unless otherwise indicated:

Dry-set Portland cement mortar, factory sanded and meeting the requirements of ANSI A118.1-1988 and Tile Council of America Formula 759.



2.05 GROUTING MATERIALS

A. Latex-Portland-Cement Grout: Proprietary pre-blended compound of Portland cement, selected and graded aggregates, color pigments and chemical additives gauged with latex additive to comply with manufacturer's directions.

Use latex additive in grout which is compatible with latex additive in latex-Portland cement mortar.

B. Dry-Set Grout: Proprietary compound composed of Portland cement and additives formulated for type of tile installed.

C. Grout Color: As selected at time of submittals.

2.06 MISCELLANEOUS MATERIALS

A. Metal Edge Strips: Zinc alloy or stainless steel, 1/8 inch (3.175 mm) at top edge with integral provision for anchorage to substrate, unless otherwise indicated.

B. Tile Cleaner: Product specifically acceptable to manufacturer of tile and grout manufacturer for application indicated and as recommended by Ceramic Tile Institute, 12061 West Jefferson Blvd. Culver City, CA 90230.

C. Cleavage Membrane: 4 mil (0.102 mm) polyethylene film per ASTM C171 Type 1.1.2.

D. Reinforcing: 2 inch x 2 inch (51 mm x 51 mm) x 16/16 gauge welded wire mesh or equivalent.

PART 3 – EXECUTION

3.01 INSPECTION

A. Preparation: Examine surfaces to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until unsatisfactory conditions are corrected by Contractor and comply with requirements indicated in referenced tile installation standards, manufacturer's installation instructions, and meets SDR's approval.

3.02 INSTALLATION

A. ANSI Tile Installation Standard: Comply with applicable parts of ANSI A108 series of tile installation standards included under "American National Standard Institutes Specifications for the Installation of Ceramic Tile".

B. Tile Council of America Installation Guidelines: Follow (TCA "Handbook for Ceramic Tile Installation"); comply with TCA installation methods and the following:

1. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, obstructions, edges and corners without disrupting pattern or joint alignments.

2. 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.

3. Jointing Patterns: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown.

4. Expansion Joints: Locate expansion joints and other sealant filled joints, including control, contraction isolation joints, where indicated, or if not indicated, at spacings and locations recommended in TCA "Handbook for Ceramic Tile Installation", and approved by SDR.

Prepare joints and apply sealants to comply with requirements of referenced standards and sealant manufacturer.

5. Grout tile to comply with referenced installation standards, using grout materials indicated.

Mix and install proprietary components to comply with grout manufacturer's directions.

3.03 FLOOR TILE INSTALLATION METHODS A. General: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction, and grout types:

1. Thin-Set Portland Cement Mortar: ANSI A108.5.
2. Concrete Subfloor, Interior: TCA F111 cleavage membrane (bond breaker).
3. Concrete Subfloor, Interior: TCA F113 (bonded).
4. Bond Coat: Portland cement paste on plastic bed or the following thin-set mortar on cured bed, ANSI A108.5, at Contractor's option: Latex-Portland cement mortar.

B. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood or other flooring which finishes flush with top of tile.

3.04 WALL TILE INSTALLATION METHODS

Install types of tile designated for wall application to comply with requirements indicated below for setting bed methods, TCA installation methods related to subsurface wall conditions, and grout types:

Thin-Set Portland Cement Mortar: ANSI A108.5.

- A. Masonry Interior: TCA W212 (with leveling coat).
- B. Masonry, Interior: TCA W213.
- C. Metal Studs, Interior: TCA W244.

3.05 CLEANING AND PROTECTION



A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but not sooner than 14 days after installation. Protect metal surfaces, cast iron and vitreous plumbing fixtures from effects of acid cleaning. Flush surfaces with clean water before and after cleaning.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded or otherwise defective tile work.

C. Protection: When recommended by tile manufacturer, apply a coat of neutral protective cleaner to completed tile walls and floors. 1. Grout Sealer: Provide and apply manufacturer's standard [Silicone or Teflon] product for sealing grout joints that does not change color or alter appearance of the grout.

2. Protect installed tile work with Kraft paper and cardboard or other heavy covering during construction period to prevent staining, damage and wear. Prohibit foot and wheel traffic from using tiled floors for at least seven (7) days after grouting is completed.

D. Before construction complete, remove protective coverings and rinse tile with neutral cleaner compatible for use with tile and approved by tile and grout manufacturers.

END OF SECTION

SECTION 09 64 19 - WOOD COMPOSITION FLOORING



PART 1 - GENERAL

1.01 QUALITY ASSURANCE

- A. Installer Qualifications: Company or person specializing in performing the work of this section with minimum 10 years experience.
- B. Quality Assurance Submittals: Submit manufacturer's installation procedures that shall be basis for accepting or rejecting actual installation procedures.

1.02 SECTION REQUIRMENTS

- A. Submittals: Product Data. Samples not less than 12" x 12".

1.03 PROJECT CONDITIONS

- A. Materials shall be delivered to Project in advance of installation to permit moisture content to stabilize to ambient conditions.
- B. Do not install engineered wood flooring until wet construction activities are completed and ambient air at installation space has moisture content stabilized.
- C. Maintain a minimum room temperature of 65°F for a period starting 7 days prior to delivery of materials to after installation.
- D. Deliver and store products in manufacturer's unopened packaging until ready for installation. Boxes should be stored in protected and dry place.

PART 2 - PRODUCTS

2.01 WOOD FLOORING

- A. Manufacturer: Oregon Lumber Company
- B. Bellagio Microline White Oak-Fumed
 - 1. Description: Engineered multi-ply laminated construction using non-formaldehyde laminating adhesive
 - 2. Planks shall meet or exceed Hardwood Plywood Veneer Association (HPVA) Type II bond test
 - 3. Species/Color/Finish/Pattern: Fumed White Oak with UV Polyurethane Finish



4. Width: 7" tongue and groove

Length: random lengths up to 86.6"

6. Thickness: 3-ply, 9/16" minimum

7. Wear-layer: 3 mm

8. Installation: Glue

9. <http://www.oregonlumber.com/engineered-and-solid-engineered/bellagiomicroline-56-engineered>

2.02 ACCESSORY MATERIALS

A. Adhesives: Water resistive, formaldehyde-free type as recommended by flooring manufacturer. VOC Content: Not more than 100 g/L when calculated according to CFR 40, Part 59, Subpart D (EPA Method 24)

B. Fasteners: As recommended by manufacturer, but not less than that recommended in NWFA's "Installation Guidelines: Wood Flooring."

C. Sub-Floor Filler: Latex cement patching compound

D. Rosin paper, as recommended by manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All sub-floors must be clean, level, and dry. Scrape and smooth any debris off of the surface. Sand high areas or joints. Fill lower areas and cracks with proper compound.

B. Open box just before installation. Each floor board must be properly checked before installation. Never install damaged boards.

C. Color variation in boards may occur. It is recommended to work out of several boxes at once to create a color blend and balanced appearance of the boards.

D. Always begin installation with the groove side of the floorboard facing to the closest wall.

E. Allow a minimum ½" distance between flooring edges and the wall on all sides to accommodate for any expansions. Use temporary spacing wedges for this purpose.



Remember to remove all spacing wedges once installation is complete.

F. Place floorboards alongside each other staggering their joints at least 20" apart.

G. Refer to manufactures instructions for specific steps related to floating, glue-down or nail down installation.

<http://www.oregonlumber.com/sites/default/files/downloads/Bellagio%20Installation%20101705.pdf>

END OF SECTION

SECTION 09 90 00 - PAINTING



PART 1 GENERAL

1.01 DESCRIPTION:

A. The surfaces to be painted in this Work are indicated on the Drawings (in the Room Finish Schedule, List of Finishes, and as specifically noted) and in the Painting Schedule in this Section of these Specifications.

B. Surfaces to be painted: Except for surfaces specified or scheduled not to be painted and except for factory-finished items, job-paint all surfaces, interior and exterior, exposed to view or weather. Examine other sections of these specifications to determine other items which are factory-finished or prime-coated. Prime-coated items shall be job-finished under this section. Special attention must be given to the painting of all doors. All required finishes must be applied to all surfaces - See Section 3.04 N.

B2. Note: In all areas having an "open interior structure" (no ceiling), all exposed elements and construction shall be painted. Such elements include, but are not limited to, ductwork, metal roof deck, steel joists, bridging, etc. steel beams, and other structural components. Different elements shall be painted in different colors. Refer to the Drawings for specific information.

C. Surfaces not to be painted: Surfaces not to be finished under this Section: non-ferrous metals, acoustical ceilings, floor coverings, wallcoverings, and roofing. In mechanical and electrical equipment rooms and similar spaces used by maintenance personnel only, do not paint conduit, piping, structural steel or steel joists except for touch-up, unless scheduled otherwise.

D. Related work in other sections: Hollow Metal Work (Section 08110), and Gypsum Drywall (Section 09250).

1.02 SUBMITTALS:

A. Painting materials scheduled are products of **KWAL Paint Manufacturing Co.**, unless indicated otherwise. Substitutions may be requested in accordance with Shop Drawings and Submittals (Section 01340). Approved manufacturer's specifications must be adhered to. The following are acceptable, subject to specification compliance; first line products as selected by Architect:

Possible substitute colors must be exact computer match to the specified colors.

1. KWAL Paint Manufacturing Company
2. Pittsburgh
3. Sherwin-Williams
4. Benjamin Moore

B. Submittals: Before starting work, submit a schedule in triplicate showing the name of paint manufacturer, type of paint to be used on each different surface in building.

C. Color selections: Color schedules will be issued prior to beginning of painting work. In general, color schemes will be repeated so excessive number of colors are generally not required. However, for pricing purposes, the contractor, shall not base his bid on a color limit. No additional funds will be granted for multiple color and/or



texture selections. Colors; factory mixed, but Contractor shall tint samples at job as required until the colors, textures are satisfactory.

D. Color samples: Prepare samples of each kind of painted work and each color for approval sufficiently in advance of beginning of work to permit adequate time for consideration of materials, colors. Prepared samples minimum 12" squares.

E. Provide certificates stating fire hazard classification of each material furnished for this project under any specification provision related to fire resistance or surface burning characteristics.

1.03 PRODUCT HANDLING:

A. Deliver sealed containers with labels legible, intact.

B. Store and mix materials only in such rooms as may be assigned for this purpose and take all necessary precautions to prevent fire. Comply with health, fire regulations.

C. Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently or not to be painted.

D. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

1.04 QUALITY ASSURANCE:

All paint products used for interior spaces, must comply with "EPA Method 24", meaning it must contain less than 450 grams of VOC/VOS per liter of coating (3.8 pounds per gallon).

PART 2 PRODUCTS

2.01 PAINT MATERIALS:

A. Where necessary to thin any oil vehicle paint materials, use either pure linseed oil or turpentine unless manufacturer of material calls for other types of thinners.

B. Use one brand of materials insofar as possible. In any case, primers and sealers shall be same brand as finish coats.

C. Paint, varnish, fillers: Of type, brand hereinafter specified under "Schedule of Painting Materials" such as linseed oil, shellac, turpentine, etc. shall be of highest quality, with identifying labels on containers.

D. All paint to be Alkyd base unless noted otherwise.

PART 3 EXECUTION

3.01 ENVIRONMENTAL REQUIREMENTS:



A. Comply with manufacturer's recommendations as to environmental conditions under which coating, coating systems, can be applied.

B. Do not apply finish in area where dust is being generated.

3.02 EXAMINATION OF SURFACES:

Carefully inspect surfaces to be painted, covered or otherwise finished, and notify in writing of any defects, improper materials, workmanship or other defects which will affect satisfactory execution and permanency of work. Absence of such notification shall be construed as acceptance by this subcontractor of surfaces, and later claims of defects in surfaces will not relieve this subcontractor from responsibility under his guarantee.

3.03 PREPARATION OF SURFACES:

NOTE: The complete and proper preparation, including but not limited to, cleaning, sanding, stripping, patching, and leveling of all surfaces which have existing and old finishes, shall be part of this contract. It shall be the contractor's responsibility to examine all existing surfaces, prior to Bid. Requests for additional funding at a later time will not be granted.

A. Wood: Sandpaper to smooth, even surface, then dust off. Prime knots, pitch streaks, with two coats shellac before priming. After priming has been applied, thoroughly fill nail, other holes, cracks, with plastic wood or putty. Sandpaper, dust off between coats.

B. Steel and iron: Remove grease, rust scale, dust; touch up any chipped or abraded places on shop-coat. Remove heavy coating of scale from ferrous metal by wire-brushing or sandblasting as necessary to produce a satisfactory surface for painting.

C. Galvanized metal: Wash untreated surfaces with solution of chemical phosphoric metal etc., allow to dry at least 12 hours, dust off. All exposed galvanized surfaces shall be painted except at structural steel.

D. Gypsum board and plaster: Before painting, test with moisture testing device, apply no paint or sealer when moisture content exceeds 8%. Test sufficient areas in each space as often as necessary, to determine proper moisture content for painting. Gypsum board and plaster used as backing for wall fabric shall receive one coat of size.

E. New and Previously Painted Concrete Tilt-up Surfaces:

Surface to be painted should be free of all dirt, chalk, grease/oil, loose and flaking paint, etc., in accordance with SSPC-SP-2 (Hand-Tool Cleaning), SSPC-SP-3 (Power-Tool Cleaning), or NACE RF-01-72 (Water-Blast Cleaning).

In severe cases, all old paint shall be removed.

New concrete surfaces must be allowed to cure no less than 30 days.

All surface imperfections need to be filled with appropriate patching material.

1. General: Before painting, remove hardware, accessories, plates, similar items or provide ample protection of such items. Upon completion of each space, replace. Remove doors to paint top and bottom edges.

G. Provide scaffolding, drop cloths and other equipment necessary to execute work, and which is not specifically mentioned to be provided by others.

3.04 APPLICATION:

A. Apply to highest standards by skilled mechanics.

B. Surfaces to be painted shall be clean, dry smooth, protected from dampness. Each coat of paint shall be well brushed on, worked out evenly. Comply with recommendations of product manufacturer for drying time between succeeding coats. Except as specifically approved otherwise by the Architect, confine spray application to metal frame work and similar surfaces where brush work would be obvious and undesirable.

NOTE: Where spray application is used, back rolling of prime coat on gypsum board is required. Do not double back with spray equipment to build up film thickness of two coats in one pass.

C. Vary slightly the color of successive coats. Secure approval of each coat before proceeding with next coat.

D. Finish coats shall be smooth, free of brush marks, streaks, laps or pile-up of paints, skipped or missed areas.

E. Make edges of paint adjoining other materials or colors clean, sharp with no overlapping.

F. Paint prime-coated hardware, grilles and registers same color surrounding material.

G. Back-priming shall be of same material as specified for front side; required for all wood cabinets, millwork, trim, except where finish is plastic laminate. Back primed concealed parts before erection. Take care that back painting does not contact exposed finish surface.

H. Do not paint sealant unless directed.

I. Fire and smoke rated partitions as identified on plans shall be permanently identified on both sides above ceilings and in concealed spaces by red-painted stenciled notices spaced not over 10 feet apart. Lettering shall be not less than one (1) inch high. Wording at corridors shall be "CORRIDOR PARTITION -PROTECT OPENINGS". At smoke compartment boundaries, wording shall be "SMOKE PARTITION-PROTECT OPENINGS". At horizontal exit walls, exit enclosures, hazard enclosures and other fire walls wording shall be "ONE-HOUR FIRE BARRIER - PROTECT OPENINGS" (or TWO-HOUR, as indicated on plan).

J. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.

K. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.

L. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.M. Prime faces of wood doors, except where plastic faced, with one coat of clear alkyd sealer as soon as doors are delivered to job site.



N. Scheduled door finish (paint or stain with sealer - not only sealer!) must be applied to **all door surfaces, including tops, bottoms, and all sides**. Non-Compliance with this requirement will be subject to rejection of the installed doors. DO NOT REMOVE OR PAINT OVER DOOR LABELS INDICATING FIRE RATING!!!

NOTE: Prior to commencing the painting work, the painting contractor must provide a written statement to the Architect wherein they acknowledge that the content of the above requirements are completely understood, and will be fully implemented.

O. Re-coat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

P. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.

Q. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.

R. Provide satin finish for final coats, unless otherwise indicated.

S. Complete Work: Match approved samples for color, texture, and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

T. Paint all cover plates for electrical, plumbing, mechanical, telephone, computer, etc. regardless when these items get installed. At project completion all these items must be painted to match adjacent surface.

1. Unless noted otherwise, smooth surfaces, such as gypsum board, plaster, concrete, etc., shall receive a "TEXTURE COAT", prior to the application of all paint types. Typically, a minimum of three different texture field samples, including the selected paint color must be provided for the Architect's and Owner's selection.
1. "MULTI COLOR" paint types, such as, Zolotone, Aqua Fleck, Cor-O-Fect III, or equal. Must have lead painter who is "manufacturer" trained and qualified in the application of this material. (It is a mandatory project requirement, that the painting contractor have a letter of recommendation from the manufacturer.)
1. Wherever paint is used on metal deck to receive fireproofing, it shall be the responsibility of the contractor to determine compatibility with spray-applied fire resistive material.

3.05 CLEANING:

A. At the completion of work of other trades touch-up and restore all damaged or defaced painted surfaces.

B. Remove spilled, splashed or splattered paint from all surfaces.

C. Leave unfinished space clean, in condition required for equivalent spaces in project.

3.06 PAINTING SCHEDULE:

(NOTE: Schedule is based on " KWAL PAINT COMPANY" Products, equal products from different manufacturer's may be approved by the Architect.) Substitutions would require exact computer match to the specified colors.

3.06.1 EXTERIOR PAINT SCHEDULE:

A. Concrete, Stucco, and Masonry (other than Concrete Unit Masonry): Provide the following finish systems over exterior concrete, stucco, and brick masonry substrates:

1. 100% Acrylic Flat Finish **Two finish coats** over a primer.
1. Primer: 5860 Pro-Finish all purpose 100% acrylic primer undercoat. Applied at a dft of not less than 1.8 mils.
1. Finish Coats: 6300 Accu-Pro 100% acrylic flat finish. Applied at a dft of not less than 1.7 mils.
1. Texture Coating: **One finish coat** over a properly prepared substrate.
1. Primer: 5801 Epotilt Epoxy Modified 100% acrylic primer. Applied at a dft of not less than 3.0 mils, **or** self-priming after power washing.
1. Finish Coat: 59 Series Sunfoe Texture Coating. Applied at a dft of not less than 12.0 to 14.0 mils.

B. Concrete Unit Masonry: Provide the following finish systems over exterior concrete unit masonry:

1. 100% Acrylic Flat Finish: **Two finish coats** over block filler.
1. Block filler: 5890 Accu-Pro latex block filler. Applied to a dft not less than 8.0 to 12.0 mils.
1. Finish Coats: 6300 Accu-Pro 100% acrylic flat finish. Applied at a dft not less than 1.7 mils.

C. Exterior Gypsum Soffit Board: Provide the following finish systems over exterior gypsum soffit board:

1. 100% Acrylic Flat Finish: **Two finish coats** over an exterior alkali-resistant primer:
1. Primer: 5860 Pro-Finish All-Purpose 100% acrylic primer undercoat. Applied to a dft no less than 1.8. mils.
1. Finish Coats: 6300 Accu-Pro 100% acrylic flat finish. Applied to a dft not less than 1.7 mils.
1. 100% Acrylic Semi-Gloss enamel Finish: **Two finish coats** over a primer.
1. Primer: 5860 Pro-finish All-Purpose 100% acrylic primer undercoat. Applied to a dft not less than 1.8 mils.
1. Finish Coats: 3200 Ambassador 100% acrylic semi-gloss block resistant enamel. Applied to a dft of not less than 1.6 mils.

D. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items (spot prime as needed).

1. 100% Acrylic Gloss Enamel Finish: **Two finish coats** over a rust-inhibitive primer.

1. Primer: 5810 Ambassador G-Prim latex metal primer. Applied at a dft of not less than 1.8 mils.
1. Finish Coats: 8300 W.B. Industrial DTM gloss enamel. Applied at a dft of not less than 2.5 mils.
1. Full-Gloss Alkyd-Enamel Finish: **Two finish coats** over a rust-inhibitive primer.
1. Primer: 9210 Accu-Pro rust-inhibiting primer. Applied to a dft of not less than 2.0 mils.
1. Finish Coats: 9800 Accu-Pro alky gloss enamel. Applied to a dft not less than 1.5 mils.
1. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-metal surfaces:
 1. 100% Acrylic Gloss Enamel Finish: **Two finish coats** over a galvanized primer.
1. Primer: 5810 Ambassador G-Prime latex primer. Applied to a dft of not less than 1.8 mils.
1. Finish Coats: 8300 W.B. industrial DTM gloss enamel. Applied at a dft of not less than 2.5 mils.
1. Full-Gloss Alkyd-enamel: **Two finish coats** over a glvanized metal primer.
1. Primer: 5810 Ambassador G-Prime latex primer. Applied to a dft of not less than 1.8 mils.
2. Finish Coats: 9800 Accu-Pro alkyd gloss enamel. Applied at a dft of not less than 1.5 mils.
1. Aluminum: Provide the following finish systems over exterior aluminum surfaces:

Full-Gloss Alkyd-Enamel finish: **Two finish coats** over a primer.

1. Primer: 5810 Ambassador G-Prime latex primer. Applied to a dft of not less than 1.8 mils.
1. Finish Coats: 931-424 Urethane/Alkyd high gloss enamel (Duronodic Bronze Satin). Applied at a dft of not less than 1.5 mils.

3.06.2 INTERIOR PAINT SCHEDULE:

1. Concrete and Masonry (other than Concrete Unit Masonry): Provide the following paint systems over interior and brick masonry substrates:
 1. Flat Acrylic Finish: **Two finish coats** over a primer.
1. Primer: 0800 Accu-Tone Hi-Hide PDQ Sealer. Applied at a dft of not less than 1.4 mils.
1. Finish Coats: 0910 Accu-Pro flat latex. Applied to a dft of not less than 1.6 mils.
1. Low-Luster Acrylic-enamel Finish: **Two finish coats** over a primer.
1. Primer: 0800 Accu-Tone Hi-Hide PDQ Sealer. Applied at a dft of not less than 1.4 mils.
1. Finish Coats: 0910 Accu-Pro PC latex eggshell. Applied to a dft of not less than 1.5 mils.
1. Waterborne Polyamide Gloss Epoxy: **Two finish coats** over a primer.

1. Primer: 5860 Pro-Finish All-Purpose 100% acrylic primer undercoat. Applied at a dft of not less than 1.8 mils.
1. Finish Coats: 3160 Water Epoxy Polyamide Coating. Applied to a dft of not less than 1.5 mils.
1. Multi-Color Seamless Wallcoating Finish: **Two finish coats** over a primer.
1. Primer: 5860 Pro-Finish All-Purpose 100% acrylic primer undercoat. Applied at a dft of not less than 1.8 mils.
1. Finish Coats: 9134 COR-O-FECT III Multi-Color Seamless Wallcoating Coating. Apply at 125 to 175 SF per gallon.
1. Concrete Unit Masonry: Provide the following finish systems over interior concrete unit masonry:
 1. Flat Acrylic Finish: **Two finish coats** over block filler.
 1. Block Filler: 5890 Accu-Pro latex block filler. Applied to a dft of not less than 8.0 to 12.0 mils.
 1. Finish Coats: 0910 Accu-Pro flat latex. Applied to a dft of not less than 1.6 mils.
 1. Low-Luster Acrylic enamel Finish: **Two finish coats** over block filler.
 1. Block Filler: 5890 Accu-Pro latex block filler. Applied to a dft of not less than 8.0 to 12.0 mils.
 1. Finish Coats: 2100 Accu-Pro latex eggshell. Applied to a dft of not less than 1.5 mils.
 1. Semi-Gloss Acrylic Enamel Finish: **Two finish coats** over block filler.
 1. Block Filler: 5890 Accu-Pro latex block filler. Applied to a dft of not less than 8.0 to 12.0 mils.
 1. Finish Coats: 2300 Accu-Pro alkyd semi-gloss enamel. Applied to a dft of not less than 1.7 mils.
 1. Semi-Gloss Alkyd-Enamel finish: **Two finish coats** over block filler.
 1. Block Filler: 5890 Accu-Pro latex block filler. Applied to a dft of not less than 8.0 to 12.0 mils.
 1. Finish Coats: 4600 Accu-Pro alkyd semi-gloss enamel. Applied to a dft of not less than 1.7 mils.
1. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
 1. Flat Acrylic Finish: **Two finish coats** over block filler.
 1. Primer: 0800 Accu-Tone Hi-Hide PDQ Sealer. Applied to a dft of not less than 1.4 mils.
 1. Finish Coats: 0910 Accu-Pro flat latex. Applied to a dft of not less than 1.6 mils.
 2. Low-Luster Acrylic Enamel Finish: **Two finish coats** over block filler.
 3. Primer: 0800 Accu-Tone Hi-Hide PDQ Sealer. Applied to a dft of not less than 1.4 mils.

1. Finish Coats: 2100 Accu-Pro latex eggshell. Applied to a dft of not less than 1.5 mils.
1. Semi-Gloss Acrylic Enamel Finish: **Two finish coats** over block filler.
1. Primer: 0800 Accu-Tone Hi-Hide PDQ Sealer. Applied to a dft of not less than 1.4 mils.
1. Finish Coats: 2300 Accu-Tone Semi-Gloss latex enamel. Applied to a dft of not less than 1.5 mils.
1. Multi-Color Seamless Wallcoating Finish: **Two finish coats** over a primer.
1. Block Filler: 5890 Pro-Finish All-Purpose 100% acrylic primer undercoat. Applied to a dft of not less than 1.8 mils..
1. Finish Coats: 9134 COR-O-FECT III Multi-Color Seamless Wallcoating. Apply at 125 to 175 SF per gallon.
1. Waterborne Polyamide Gloss Epoxy: **Two finish coats** over a primer.
1. Primer: 5860 Pro-Finish All-Purpose 100% acrylic primer undercoat. Applied at a dft of not less than 1.8 mils.
1. Finish Coats: 3160 Water Epoxy Polyamide Coating. Applied to a dft of not less than 1.5 mils.
1. All Interior Gypsum Board Surfaces at Patient Care Areas of Hospitals. Low sheen 100% Acrylic Latex: **Two finish coats** over a primer.
1. Primer: 0890 Accu-Pro Sandable Drywall Prime. Applied to a dft of not less than 1.4 mils.
1. Finish Coats: 7100 Series Liquid Vinyl Low Sheen 100% Acrylic finish. Applied to a dft of not less than 1.5 mils.
1. Interior Concrete Floors: Provide the following paint finish system over interior concrete floors:
 1. Amine Adduct Gloss Epoxy; Abrasive blast followed by **two finish coats** over a Sealer coat.
 1. Seal Coat: 9142 Amine Adduct Epoxy thinned 25% with clean water.
 1. Finish Coats: 9142 Amine Adduct Epoxy. Applied not less than 3.0 to 4.0 mils wet.
 1. Clear Low Gloss Sealer and Finish: **Two finish coats**.
 1. Finish Coats: OKON 940 Seal and Finish water based satin. Apply per manufacturer's recommendations.
1. Wood and Hardboard: Provide the following paint finish systems over new interior wood surfaces:
 1. Semi-Gloss Alkyd-Enamel finish: **Two finish coats** over a primer.
 1. Primer: 4200 Accu-Pro fast dry alkyd undercoat. Applied to a dft of not less than 1.8 mils.
 1. Finish Coats: 4600 Accu-Pro alkyd semi-gloss enamel. Applied to a dft of not less than 1.7 mils.

1. Ferrous Metal: Provide the following finish systems over ferrous metal:
 1. Full-Gloss Alkyd-enamel Finish: **Two finish coats** over a primer.
 1. Primer: 9210 Accu-Pro Rust-Inhibiting Primer. Applied to dft of not less than 2.0 mils.
 1. Finish Coats: 9800 Accu-Pro Alkyd Gloss enamel. Applied to a dft of not less than 1.5 mils.
1. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:
 1. 100% Acrylic Gloss Enamel Finish: **Two finish coats** over primer.
 1. Primer: 5810 Ambassador G-Prime latex metal primer. Applied to dft of not less than 1.8 mils.
 1. Finish Coats: 8300 W.B. Industrial DTM gloss enamel. Applied to a dft of not less than 2.5 mils.
 1. Full-Gloss Alkyd-enamel Finish: **Two finish coats** over a galvanized metal primer.
 1. Primer: 5810 Ambassador G-Prime latex metal primer. Applied to dft of not less than 1.8 mils.
 1. Finish Coats: 9800 Accu-Pro alkyd gloss enamel. Applied to a dft of not less than 1.5 mils.

3.06.3 INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE:

1. Stained Woodwork and Wood Doors: Provide the following stained finishes over new interior woodwork and wood doors:
 1. Alkyd-Based Stain Satin-Varnish Finish: **Two finish coats** of alkyd-based clear satin varnish over a sealer coat and interior wood stain.
 1. Stain coat: 8709 Woodcraft Semi-Transparent stain.
 1. Sealer Coat: 4048 Woodcraft Sealer/finish Satin.
 1. Finish Coats: 4039 Woodcraft Satin Varnish.

NOTE 1. All exposed wood surfaces of any kind within the project shall be covered under this provision, unless they are specifically and clearly excluded. If in doubt, contractor must obtain clarification, prior to bidding.

NOTE: 2: Approximately six, 8" x 12" different color samples (on maple veneer) are required for the Architect's final selection.

3.07 MATERIAL COMPLIANCE:

Work in this section of the specifications shall be governed by General Requirements, Section 01060 - Codes and Standards. If conflict exists between products and methods herein specified and the Section noted above, notify Architect before bidding.

END OF SECTION



DIVISION 10 – SPECIALTIES

SECTION 10 00 00 - SPECIALTIES

PART 1 GENERAL

1.01 DESCRIPTION:

A. Specialties required for this Work are indicated on the Drawings and include, but are not necessarily limited to items in Part 2 of these Specifications.

B. Related work described elsewhere includes Concrete Work (Section 03300), Carpentry (Section 06100), Gypsum Drywall (Section 09250), Metal Toilet Partitions, (Section 10155), Plastic Toilet & Shower Partitions (Section 10160), Mechanical (Division 15), Electrical (Division 16).

C. Toilet accessories, corner guards, access doors, closet rods, installed under Carpentry (Section 06100) but furnished in this Section.

1.02 SUBMITTALS:

A. Products of other manufacturers of equal type and quality may be submitted for approval in accordance with Shop Drawings and Submittals (Section 01340). Approved manufacturer's specifications must be adhered to.

B. Samples: Submit samples of each type and color of toilet stalls, full height corner guards, bumper guards, toilet accessories from full range of manufacturer's offering.

C. Shop Drawings: Submit shop drawings, product and installation data for specialty items and accessories in accordance with requirements stated in General Conditions and Shop Drawings and Submittals (Section 01340).

1.03 PRODUCT HANDLING:

A. Use all means necessary to protect all specialty products before, during and after installation and to protect the installed work and materials of all other trades.

B. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 CUSTODIAL ACCESSORIES

1. Mop Holder: NO. B-224X48. Stainless steel shelf (8" deep x 48" wide), 18 gauge, satin finish, with 6 spring loaded anti slip rubber cams, 5 hooks and rod below. Provide at all janitorâ€™s closets, or similar purpose rooms (Manufacturer: **BOBRICK**)



1. Coat Hook, Shelf System : No. H.1 (H-2) extended aluminum slats, satin (bronze) finish, with integral coat hooks, single (double) shelf system, (11-1/2" deep x 48" wide x 12" (24") high. Provide where shown on the Drawings (Manufacturer: EMCO SPECIALTY PRODUCTS, INC., Kansas City, KS).

C. Closet Rod: No. 660 rod with No. 734 flanges manufactured by **Knappe and Vogt Company**. Provide at all closets, unless noted otherwise.

2.02 ACCESS DOORS:

A. All access doors manufactured by the **WILLIAMS BROS. CORPORATION OF AMERICA** (FRONT ROYAL, VIRGINIA), or approved equal.

B. GENERAL PURPOSE ACCESS DOORS, AND CEILING ACCESS PANELS TO INCLUDE:

1. Door and Trim: 14 gauge steel
2. Return Frames: 16 gauge steel
3. Hinges: Fully concealed piano-type, size to appropriate to support door panel size
4. Latches: Flush, steel cam operation
5. Finish: Electrostatically applied baked enamel, this coating must be suitable to receive prime paint coat. (Unless another finish is specified.)
6. Accessories: Include - at no extra cost - all required anchors, straps, fasteners
7. Size: As shown on drawings, or as-by common sense-required to serve specific location.
8. Location: As shown on drawings, and as required to access mechanical, plumbing, electrical features.

C. FIRE RATED ACCESS DOOR TO INCLUDE:

1. Door: 14 gauge steel
2. Trim and Return: 16 gauge steel
3. Insulation: Approximately 2" thick mineral wool contained in door cavity
4. Hinge: Fully concealed pivot type
5. Latches: Self-latching direct action lock, opposite hinge. Provide keyed lock, and knob
6. Automatic door closer on all doors
7. Inside panel release on all doors
8. Finish: Electrostaticly applied baked enamel, this coating must be suitable to receive prime paint coat. (Unless another finish is specified.)



9. Accessories: Include - at no extra cost - all required anchors, straps, fasteners.
 10. Size: As shown on drawings, or as - by common sense - required to serve specific location.
 11. Location: As shown on drawings, and as required to access mechanical, plumbing, electrical features in rated walls and partitions.
 12. Label: Provide certificate by UNDERWRITERS LABORATORIES (UL), or WARNOCK HERSEY (WH), proving that access door has same fire rating as wall or partition.
- D. FIRE RATED CEILING ACCESS PANEL TO INCLUDE:
1. Door: 16 gauge steel recessed pan
 2. Frame: 16 gauge steel, hat channel configuration
 3. Insulation: 1/2" ceramic fiberboard
 4. Hinges: Continuous piano hinge, at long side of door
 5. Latches: Self-latching direct action lock, opposite hinge. Provide keyed lock, and knob.
 6. Automatic Panel Closer: Spring operated, controlled by pneumatic tube at all panels.
 7. Finish: Electrostatically applied baked enamel, this coating must be suitable to receive prime paint coat. (Unless another finish is specified.)
 8. Size: As shown on drawings, or as - by common sense-required to serve specific location.
 9. Location: As shown on drawings, and as required to access mechanical, plumbing, electrical features in rated ceiling assemblies.
 10. NOTE: Panel will be covered with acoustical ceiling tiles, verify that proper functioning is maintained.
 11. (If indicated): Panel will be covered with acoustical ceiling tiles, verify that proper functioning is maintained.
 12. Refer to drawings, plans, and details. Unless otherwise indicated, all ceiling access panels must clearly fit into the 24-3/4" 24-3/4" ceiling pattern. Provide appropriate size - AT NO EXTRA COST.

*2.02 ACCESS DOORS:

- A. All access doors manufactured by Birmingham Ornamental Iron company (**BOICO**).
- B. Access Door: Style "A" 14 gauge steel door, 16 gauge frames, concealed spring type hinges, shop coated finish, sizes indicated on drawings, or as required by job condition. Adjust location to provide access to mechanical, plumbing or electrical items as indicated or required.
- C. Fire-Rating: An access door must be installed in a fire-rated surface; provide UL labeled rated access door.
- D. Access Door in Gypsum Board Ceiling: Provide smoke seal, UL labeled rating, finish to match ceiling surface.



2.03 CORNER GUARDS, HANDRAILS AND BUMPER GUARDS: **(Where Shown on Drawings)**

A. Corner Guards: Vinyl Acrovyn Guard flush mounted Models SFS-10R, 1 1/4" radius, 2" x 2" x 86" or as shown on drawings; FSC-25R, 1 1/4" radius, 2" x stud width; manufactured by **Construction Specialties, Inc.** Color to be selected. Submit samples.

B. Handrails: Vinyl **Acrovyn** Bumper Action Handrail HRB-4C. Color to be selected - submit samples.

C. Crashrails: Vinyl **Acrovyn** Wrap-Around SCR-64 (8"), and/or BCR-40 (4") - See Drawings. Color to be selected - submit samples.

*2.03 Provide the following **ACROVYN** products by CONSTRUCTION SPECIALTIES (C/S GROUP) where shown on Drawings in the configurations indicated and colors noted: (No substitutions)

A. FLUSH CORNER GUARDS: SFS-20 (1/4" radius, 2" x 2" x 86"), SFS-20R (1/4" radius, 2" x 2" x 86", where required in rated wall), FSC-25 (1/4" radius, 2" x stud width at end wall connection).

B. SURFACE MOUNTED CORNER GUARDS: SSM-20 (2", 90°), and SM-10M (2 1/2", 135°).

C. CRASHRAILS: SCR-64 (8").

D. HANDRAILS: HRB-4C (5 1/2").

E. ARMOR PLATES, KICKPLATES: TYPE 1-DP (thickness: .060").

1. HIGH IMPACT WALL COVERING: Thickness: .022".

G. HIGH IMPACT WALLCOVERING: Thickness .060".

H. HIGH IMPACT CORNER (INSIDE) TRIM as required for High Impact Wallcovering.

I. DOOR FRAME PROTECTION: TYPE "B" DFP.

2.04 TOILET ACCESSORIES:

A. All toilet accessories manufactured by **Bobrick Washroom Equipment Company**, unless indicated otherwise. Bradley, Tubular Specialties, Miami-Carey and Perma-Bilt approved equals.

B. Grab bars (at all handicap toilets): No. B-5507 series, 1 1/4" diameter, stainless steel, concealed mounting, satin finish with peened gripping surface, lengths to be 42" and 36" (Unless Shown Otherwise) - by Bobrick. **Note: All locations must be verified in field before ordering.**

C. Paper holders (at all water closets): No. B-667 by Bobrick.

D. Paper Holders (in all toilet stalls): No. B-2892 surface mounted, stainless steel 9" Jumbo Roll Twin Unit, - Bobrick. (Note: Confirm that this unit is equally accessible, and useable at right-hand, and left-hand mounting.)

E. Mirrors (at all toilets): No. B-165 Series, with stainless steel channel frame. Size: 24" wide x 36" high (Unless Shown Otherwise) - by Bobrick.



F. Paper Towel Dispenser/Waste Receptacle Combination (at all toilets): No. B36903 stainless steel, recessed mounted - by Bobrick. **Note: This model shall be provided wherever wall construction allows a recessed type. When recessing is not possible, provide surface mounted Model No. B-3699. Field verify wall conditions and locations before ordering.**

G. Paper Towel Dispenser/Waste Receptacle Combination (at vanities in lavatory/shower areas) No.B-38035 stainless steel, recessed mounted by Bobrick. **Note: Verify location and wall condition in field before ordering. If recessing is not possible provide surface mounted Model No. B-380349.**

H. Paper Towel Dispenser only (at counter sinks): No. B-263 stainless steel, surface mounted - by Bobrick.

I. Robe Hook (at all toilet doors, unless hook is an integral part of the toilet partition): No. B-671 by Bobrick.

J-1. Soap Dispenser (at all counter sinks, or lavatories): No. B-195, chrome plated ABS (vertical), and translucent shatter resistant polyethylene surface mounted - by Bobrick. **Note: Review all locations with Architect before ordering.**

J-2. Soap Dispenser (at all counter sinks, or lavatories): No. B-146 stainless steel (5" x 8" vertical), surface mounted - by Bobrick. **Note: Review wall locations with Architect before ordering.**

J-3. Soap Dispenser (at all counter sinks, or lavatories): No. 6542 stainless steel (5" x 8" horizontal), surface mounted - by Bobrick. **Note: Review wall locations with Architect before ordering.**

J-4 Soap dispenser (At all multiple vanity configurations)

No. B-8226, stainless steel and ABS, counter top mounted, by BOBRICK

1. Toilet Seat Cover Dispenser: No. B-221, Surface-Mounted, satin stainless steel, concealed bottom opening, capacity: minimum 250 seat covers, Size: 15-3/4" wide 11" high x 2" deep (Provide where indicated on the Drawings)

L. Grab bars (in all handicap showers): No. B-5507 series, 1-1/4" diameter, stainless steel, concealed mounting, satin finish with peened gripping surface, length and configuration per Drawings, and per Texas Accessibility Standards, latest edition.

(Note: This may be provided by the shower stall manufacturer.)

M. Feminine Napkins Disposal: No. B-270, surface mounted (at all toilets except male public).

N. Feminine Napkins Disposal for Two Toilet Compartments (in female toilet/shower area): No. B-354.

O. Feminine Napkins Disposal in Side Wall of End Toilet Compartment (in female toilet/shower area): No. B-3544.

P. Toilet Tissue Holder (at all toilet compartments): No. B-6857, stainless steel, surface mounted.

Q. Folding Shower Seat (in all H.C. showers): No. B-519, padded cushion, stainless steel frame.



R. Hinged Shower Seat (provide at each shower): Bradley Model No. 956-30/9561-30, 16 GA, Stainless Steel, corner seat 16" x 16" with piano hinge and support angle. Coordinate provision of concealed backing for anchorage with carpenter.

S. Hair Dryer (in toilet/shower areas, per plans): No. B-730, surface mounted, auto pilot operation. Provide electrical requirements for Electrical Contractor, review mounting height with Architect, regular adult and H.C. heights required.

T. Towel Bar at Patient Room Toilet: No. B-674 X 18".

U. Tub, Shower Rods: No. B-207, concealed mounted (at all tubs and showers).

V. Soap Dish: No. B-4380, recessed (at all tubs and showers).

2.05 LAVATORY GUARD INSULATION:

For all sinks, lavatories, and vanities which have exposed P-traps, hot and cold water piping, etc., provide a complete insulation system equal to type HANDI LAV-GUARD by **TRUE BRO INC.** Insulation kits to be manufactured of resilient vinyl and include serviceable covers for **all** (hot and cold) pipes, valves, traps, etc. Color to be white or grey per Architects selection. Insulation assembly to be molded, antimicrobial, and secured by integral concealed clips.

NOTE: All types of loose fitting, easily removable "one size fits all", sock-like or jacket-like covers are unacceptable. Only pre-molded, tightly fitting vinyl, or plastic products, which are aesthetically acceptable to the Architect will be accepted. Irregardless of the party presenting, or the route of presentation of a proposed substitute product, the substitute *shall* be approved by the **Architect** in regard to its suitability and aesthetics.

*2.06 CUBICLE CURTAINS AND TRACK (HOSPITAL TYPE):

Where sizes, locations, and configurations are shown on the Drawings, provide the following allowance which includes materials and labor:

1. Track: \$10.00 per linear foot

2. Curtains: \$25.00 per square yard

**2.06 CUBICLE CURTAINS AND TRACK:

A. Contractor to furnish and install tracks only, per hospital standard.

B. Fabric: Will be provided and installed by Owner (not in contract).

C. Drops: Kirsh #9689 PVC.

D. Track: Kirsh #9600.

E. Gates: Kirsh #9610/9611.

F. Carriers: Kirsh #9616.



G. Fabrication: To match existing cubicle curtains.

*** 206 SHOWER CURTAINS:

Shall be linen shower curtains type "STAPH CHECK" manufactured by **SALISBURY INDUSTRIES**, Los Angeles, California, telephone: 800-640-4341, or equal, and shall be rated as inherently fire resistant by a major fire rating agency, stain resistant, self-deodorizing, bacteria resistance, and anti-static Shower curtains to be provided at all shower stall locations and of sizes as indicated on the Drawings, or appropriate for the intended application. Architect will select a color from a minimum of six colors.

2.07 CUBICLE CURTAINS

Shall be products manufactured by **SALISBURY INDUSTRIES**, Los Angeles, California, telephone: 800-640-4341, or equal, and manufactured of Trevira Polyester designed for institutional use, with fire resistant qualities to meet NFPA #701 standards. Curtains to be provided at locations and of sizes as indicated on the Drawings. Architect will select from any color or texture of the Salisbury product lines SOLID, CROWN, and WINDSOR (40 colors, 3 textures).

2.08 CUBICLE CURTAIN TRACK

Tracks shall be **SALISBURY INDUSTRIES**, Los Angeles, California, telephone: 800-640-4341, 19100 Series Track system or equal, manufactured of anodized aluminum extrusion, measuring 1-3/8" wide x 3/4" high.

Carriers (# 19103) to glide inside track channel with attached 6" nickel plated steel bead chain drop #19103C 6.

End stop fittings (#19103) shall be manufactured of 16-gauge anodized aluminum and securely attached to each end of the track.

Snap-out fittings (19106) for ease of carrier insertion/removal shall be located at each end stop fitting on each run of track, and shall be manufactured of 16-gauge anodized aluminum.

Splicer fittings (#19111) for the alignment of all sections of track in excess of 16', shall be manufactured of anodized aluminum extrusions.

*2.09 LOCKERS: (Provide where shown on Drawings)

A. Manufacturer: **IDEAL PRODUCTS, INC.** or equal.

*B. Lockers: Single Tier Units 12" x 15" x 60" (or 72"), Double Tier Units 12" x 15" x 30" (or 36") overall height: 60" (or 72") including shelf, coat hooks, padlock provision, and number plate. Closed base for mounting on to bench construction and flat top for gypsum board furr-down. Locker type to be plastic laminate covered wood, with genuine raised panel wood doors (metal). Wood species, stain color, and plastic laminate colors will be selected by Architect from manufacturer's offering. (Color to be selected from manufacturer's standard offerings.) Further provide as required for a complete Locker System filler panels, closers, finished backs, and ends where needed for configuration shown. Provide all necessary devices for floor and wall anchorage. (Refer to drawings for location and amount of locker type).



**2.09 LOCKERS: (Provide where shown on Drawings)

A. Manufacturer: **LYON METAL, INC.** or equal.

B. Lockers: Double Tier Units 12" x 12" x 36" (overall height: 72" plus base), type: Industrial Quiet Locker made of 24 gauge steel body, and 16 gauge steel door, two louvers per unit, including closed style 6" high metal base for all exposed fronts and sides. Tamper-Guard Handles for pad lock use, galvanized

coat rod, zinc plated coat hooks (two), continuous sloping hood mounted on flat top of lockers, aluminum number plates. Finish: baked enamel, Architect will select from minimum 14 colors (Note: 14 standard colors must be included in bid). Further contractor shall include all required filler panels, closers, finished back panels, anchorage devices, and other items for a completely installed locker system in the shown configuration (Refer to Drawings for location, configuration amount, and types of lockers.)

2.10 LOCKER ROOM BENCHES: (Provide where shown on Drawings)

A. Manufacturer: **LYON METAL PRODUCTS, INC.** or equal.

B. Bench: Laminated Hardwood top with enameled steel pedestal, size 9 1/2" wide x 17 3/4" high x length shown on drawings. Pedestal finish: unless noted otherwise match locker color.

*2.11 FIRE EXTINGUISHER CABINETS: (Provide where shown on Drawings)

Recessed unit by **POTTER - ROEMER**, Model No. FRC 7050-DV. Stainless steel finish, clear wire glass (-8). Vertical red letters (-VR). Fire rated construction, in compliance with ADA. Outside dimensions 11 3/4" x 26 3/4", Box interior dimensions: 9" x 24" x 5". Quantities are shown on Drawings.

CONTRACTOR WILL ENSURE THAT THE SPECIFIED FIRE EXTINGUISHER FITS INTO THE CABINET.

**2.11 FIRE EXTINGUISHER CABINETS: (Provide where shown on Drawings)

Semi-recessed unit by **J. L. INDUSTRIES**, Model: "Cosmopolitan 1037V10 with die cut letters in red and #32 polish stainless steel finish trim, and door with #4 stainless steel tub. Quantities are shown on drawings.

2.12 FIRE EXTINGUISHERS (Provide one in each fire extinguisher cabinet):

POTTER-ROEMER, Model No. 3005; Size: 5 lbs.; UL Listing: 2A:10B:C; Height: 15-1/4"; Diameter: 4-1/4"; Stream Range: 12 to 18 feet.

Portable multi-purpose dry chemical unit for Class A, B and C fires. Red glossy polyester-coated steel cylinder, with pressure gauge and hose. Content storage pressure, approximately 195 PSI.

* 2.12 FIRE EXTINGUISHERS (Kitchen, etc) [Provide one unit including bracket, mounted to wall surface as indicated on the Drawings.]

POTTER-ROEMER, Model No. 3006, size 6 lbs., UL Listing: 3A:40B:C, height 16", diameter 5", stream range 12 to 18 feet. Portable dry chemical unit for Class A, B, and C fires, as required by Standard Mechanical Code for



Kitchens, and similar areas, FM approval required. Red glossy polyester-coated steel container with pressure gauge and hose.

Content storage pressure approximately 195 psi.

** 2.12 **BUCKEYE**, Model No. 500, size 17 lbs., UL Rating K, height 24 1/2", diameter 7", stream range 12 to 18 feet. Ortable wet chemical unit as required by Standard Mechanical Code for Kitchens and similar areas, FM approval required. Red glossy polyester-coated steel container with pressure gauge and hose. Operating pressure approximately 100 psi.

2.13 ACCESS FLOOR:

A. The floor system shall be Severn Access Floor System with all steel top-loc rigid-grid. Panel model No. 50 with reinforced vinyl tile. Manufactured by Donn Corporation Work Headquarters, 1000 Crocker Road, Westlake, Ohio 44145.

B. Submit shop drawings, samples and literature for each area shown in plan.

2.14 PROJECTION SCREEN:

Projection Screen: Draper Screen Company "Luma 2" heavy duty spring roller type, 6 feet by 8 feet.

2.15 MOTORIZED PROJECTION SCREEN:

A. Manufacturer: **DRAPER, INC.**

B. Model: **ENVOY** (ceilings)

* B. Model: **TARGA** (surface mounted)

C. Description: Electrically Operated Screen with Automatic Ceiling Closure, and Motor-in-Roller.

D. Short Form Specifications: Envoy [Targa] projection screen, size 9 feet high x 12 feet wide, [71 inches high x 92 inches wide] electrically operated 110-120V. AC, 60hz. 3-wire motor mounted inside screen roller, instantly reversible, lifetime lubricated, with internal thermal overload protector and electric brake. Motor mounted on rubber vibration insulators. Preset, accessible limit switches. Entire roller and drive assembly removal through bottom of case.

Roller to be 3" diameter, metal mounted on rubber insulated supports. Viewing surface of seamless PANAMAX surface, fire and mildew resistant. Bottom of viewing surface doublestitch hemmed around tubular steel dowel. Case of 3/4" warp resistant composition wood, unspliced. Wiring compartment metal lined. Bottom of case fully enclosed by two panels, mounted with full length continuous hinge. One panel to open and close automatically as screen operates. Second panel opens manually for access to electrical connections, limit switches and screen surface. Hinges mounted to allow matching of bottom panels to ceiling. Case painted with flat black primer.



3-position control switch shall stop or reverse screen at any point. Switch complete with locking switch cover plate for access control. Entire unit certified by Underwriter's Laboratories, Inc. and Canadian Standards Association.

E. Mounting Brackets: To be included.

F. Support Construction: By projection screen installer, as required for proper installation, follow guidelines of screen manufacturer.

2.16 CHALKBOARDS AND TACKBOARDS:

A. Manufacturer: **Claridge Products and Equipment, Inc.**

B. Chalkboard: No. 1346A, 4 foot x 6 foot, Vitracite porcelain enamel steel, color to be selected from manufacturer's standard colors.

C. Scheduling greaseboard: No. LCS-2044-W, 4 foot x 4 foot, white porcelain enamel steel.

D. Bulletin board: No. AC2436, natural cork, 2 foot x 3 foot.

2.17 HOOK RACKS:

Hook racks: Vogel Peterson 3P38G2, 3 hooks.

2.18 CONVEX MIRROR:

Convex mirror: For Delivery Rooms, Binswanger Detector Mirror, DR2030, 20 inches by 30 inches.

2.19 BACKPLATES FOR TV BRACKETS:

RCA Model SK-102-B. To fit RCA Bracket furnished by Owner.

2.20 TV AND VIDEO MOUNTING SYSTEM:

A. Furnish and install complete TV and Video Mounting System, including all components, and accessories required for specific application. System by **PEERLESS INDUSTRIES, INC. (708-865-8870)**, or equal.

B. Provide, as indicated on the Drawings, a complete wall and/or ceiling mounted system for TV and video, including, but not limited to anti-theft device, built-in cord and cable management, 360 degree swivel and tilt.

C. Note: Monitor and Video dimensions, and mounting support condition must be verified by Contractor prior to ordering.

2.21 MEDICINE CABINET: (Provide where shown on Drawings)

A. Manufacturer: **BASCO** Bathroom Accessories, or equal.

B. Medicine Cabinet: Recessed Model No. 374 P-W-WD overall dimension 18 1/8" x 24 1/4", including 3 glass shelves (1/4" thick with polished front edge), body 20 gauge steel. Finish: white baked on enamel, rust resistant,



rubber door silencers, door stop. Door: solid wood with unfinished birch veneer on front and edges, interior side to be white mica, magnetic catch, piano hinge.

2.22 BABY CHANGING STATION (FOLDING UNIT):

(Provide at all Public Toilet Rooms, male and female, unless noted otherwise.)

A. Manufacturer: **KOALA** Corporation, or equal.

B. Changing Station: Standard horizontal model made of polyethylene construction, including the following:

withstand a static load of 250 pounds

reinforced steel hinges

10 gauge steel mounting supports

gas shock mechanism to protect small fingers

to be in compliance with ADA

approximate size: 35" x 20" x 4".

2.23 BABY CHANGING STATION (FOLDING UNIT)

(Provide at all Public Toilet Rooms, unless noted otherwise.)

A Manufacturer: **BROCAR Products, Inc.**, or equal.

B. Changing Station Model 100 SSH-R (Folding Unit horizontal, recessed into wall) , or where field conditions will not permit a recessed application, provide (Contractor will verify):

Changing Station Model 100-SSH-SM (Folding Unit horizontal, surface mounted)

Horizontal unit, made of 14 gauge, brushed 304 stainless steel.

withstand a static load of 400 pounds

reinforced steel hinges

gas shock mechanism to protect small fingers

to be in compliance with ADA

approximate size: 34" x 21" x 4".

Replacable insulated polystyrene liner.

2.24 REVOLVING DARKROOM DOOR

(Provide at darkrooms and similar areas, as noted on the Drawings.)

1. Manufacturer: **ESECO**, or equal.

1. Darkroom Door Model: SPEEDMATIC NO. 2W36, including the following features:

stationary floor with non-skid mat

riveted and welded steel members

center suspension and self aligning ball bearings

wrap around aluminum handrails

finger grip circle at outside

“pop-out” option for ease of removal in case of emergency or passage of large items.

2.25 TELEPHONE ENCLOSURES:

Refer to Architectural Drawings (Plans and Elevations):

Wherever telephone enclosures are indicated, provide the following:

Manufacturer: PBG, P.O. Box 267, Cummings, GA 30028

(Tel: 770-887-9901), or equal

™ Product Description: PB-101/Indoor Enclosure, or equal.

Wall-mounted in succession, with dividers

size 24-1/2" wide x 35-3/16" high x 11-3/4" deep

sloped stainless steel writing shelf

perforated stainless steel divider panels

to be adaptable to phone type, as selected by the Owner at a later time

2.26 CROWD CONTROL

Refer to Architectural Drawings (Plans, Elevations, Details) Wherever Crowd Control devices (Post and Tape System) are indicated, provide the following:

A. MANUFACTURER:

LAWRENCE METAL PRODUCTS

Box 400-M

260 Spier Drive South



Bay Shore, New York 11706

Tele: (800) 441-0019

- or equal

B PRODUCT:

TENSA BARRIER - Removable posts with tape to establish traffic patterns for crowd control.

1. DESCRIPTION/INCLUSIONS:

1. Post

Post Style: 890 Standard

Removable: 89R

Size: 2" diameter

Height: 40"

Finish: Satin stainless steel 3S

Maximum Spacing: 7' - 0'

2 Socket

Must be compatible with post size

Model: 421 - 15S (surface installation)

Size: 4-1/2" deep

Cover Flange: 5-1/4" diameter, 1/4" thick, with rounded edge

Cap to be included

Finish: Satin stainless steel (preferred), or satin chrome

1. Tape

Black base color, with center stripe in white, red, yellow, or blue (Architect will determine color after viewing submittal samples at a later date).

PART 3 EXECUTION

3.01 INSTALLATION:

All specialty items shall be delivered to the job site for installation as part of Carpentry (Section 06100). All items shall be installed in accordance with manufacturer's recommendations, and in strict conformance with the

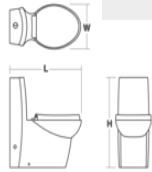
Americans' with Disabilities Act (ADA), latest edition, and with the Texas Accessibility Standards (TAS), latest edition.

END OF SECTION

Bathroom

Toilet

K-3564-0



Saile® one-piece elongated 0.8 or 1.6 GPF toilet with dual flush technology and Saile Quiet-Close™ toilet seat with Quick-Release™ functionality

Dimensions

Height 28-
3/4" Length
28-1/2"
Width 14-
1/4"

Saile

®

Making a strong, contemporary statement, the slim tank of this Saile one-piece toilet drops seamlessly into a fully skirted bowl. Two top-mounted buttons offer the choice of .8 or 1.6 gallons per flush. At the lower .8 flush

setting, this dual-flush high-efficiency toilet can save as much as 6,000 gallons of water annually over a traditional 1.6-gallon toilet. The skirted trapway creates a sleek look and makes for easier cleaning.

- Features

- One-piece toilets integrate the tank and bowl into a seamless, easy-to-clean design.
- Compact elongated bowl offers added comfort while occupying the same space as a round-front bowl.
- Top-mount two-button flush offers a choice of .8 or 1.6 gallons per flush (gpf).
- Skirted trapway simplifies cleaning.
- Saile Quiet-Close™ seat with Quick-Release™ functionality allows seat to close quietly and quickly unlatch from the toilet for easy removal and

convenient cleaning.

- Supply line not included.
- Technology
- Dual-flush technology allows you to choose between a full- or partial-flush.
- Installation
- Standard 12-inch rough-in.
- Water Conservation & Rebates
- WaterSense® toilets meet strict EPA flushing guidelines, including using at least 20 percent less water than 1.6-gallon toilets.
- Eligible for consumer rebates in some municipalities.
- This product can help a building earn Water Efficiency points in the LEED® Green Building Rating System.
- Color / Finish
- White/White

Dual Flush Actuator K-9384-SN

Save water with the dual-flush actuator, which gives you a choice of two flushing options. This top-mount button is designed for use with select Rêve™, Saile®, Escale®, Strela™, and Persuade® toilets.

Color / Finish



K-2331-1-0

Chord®

A clean, understated rim and a flat bottom make the Chord sink a compelling contemporary choice for your bathroom. The shallow basin offers a sleek alternative to traditional designs.

Dimensions

Height 5-3/4"
 Length 18-5/8"
 Width 16-13/16"

- Features
 - Single faucet hole.
 - Unique shallow basin.
 - Material
 - Vitreous china.
 - Installation
 - Countertop

Vibrant Polished Nickel

Premier pop-up drain, exposed, without overflow



K-7114-CP

Real beauty can be found in the details. KOHLER bath accessories are designed to perfectly coordinate with our fixtures and faucets, so that every element in your bath is in perfect harmony. Easy to install and built to last, our bath accessories are available in a full spectrum of beautiful finishes.

Dimensions

Height 6-5/8" Width 2-1/8"



Stillness®Widespread bathroom sink faucet

K-942-4-CP

Stillness®

Understated form and detail characterize Stillness faucets. This widespread sink faucet features an elegant, fluid style that brings a calming presence to your bathroom decor. The faucet trim includes a graceful spout and ergonomic lever handles for easy operation. Easy-to-install and leak-free UltraGlide™ valves come with the trim to provide excellent performance.

Dimensions

Height 7-1/4"

Length 3-7/8"

Width 8"

Features

- Drawing its inspiration from the pure, sleek geometry of Minimalism, Stillness is as much artistic as it is functional.
- Two-handle widespread lavatory faucet for 8" - 16" centers
- KOHLER ceramic disc valves exceed industry longevity standards two times for a lifetime of durable performance
- Premium material construction for durability and reliability
- KOHLER finishes resist corrosion and tarnishing, exceeding industry durability standards over two times
- Fluid design lines for ease of cleaning
- Handles pre-assembled on valves to simplify installation
- Part of Stillness faucet collection
- Low-flow aerator option available (please see latest price book)

Shower Faucet

Stillness®Rite-Temp® pressure-balancing shower faucet trim with lever handle, valve not included

K-T949-4-CP

Stillness®

With their streamlined style and understated detailing, Stillness faucets and accessories are an ideal complement for modern bathrooms. This shower trim reflects a calm, minimalist aesthetic, with a cleanly designed showerhead and lever handle. Pair this trim with a Rite-Temp® pressure-balancing valve with push-button diverter to maintain your desired water temperature during pressure fluctuations.

Features

- Premium material construction for durability and reliability
- KOHLER finishes resist corrosion and tarnishing, exceeding industry durability standards by over two times
- Rite-Temp® pressure-balancing technology maintains water temperature within +/-3 degrees Fahrenheit

□ High-temperature limit stop allows you to preset a comfortable maximum temperature to eliminate scalding

□ Completes Stillness design solution with KOHLER fixtures and accessories

Height 24" Length 7-

7/8" Width 6-3/8"



Vault™ 25" x 22" x 9-5/16" top-mount/under-mount medium single-bowl kitchen sink with single faucet hole



K-3822-1-NA

Vault™

The distinctive, modern design of the Vault dual-mount sink lends a contemporary vibe to your kitchen. Handcrafted from durable stainless steel, this sink features a single bowl with tightly angled corners to maximize basin space and a sloped bottom that helps with draining and cleanup. An engineered sound-absorption system significantly reduces disposal and dishwashing noise. Vault's ultra-flat rim makes it easy to wipe from the counter directly into the sink.

Dimensions

Height 9-5/16"
 Length 25" Width 22"

Features

- 27-inch minimum base cabinet width.
- Single bowl.
- 9-inch depth.
- Single faucet hole.
- Rear drain increases workspace in the sink and storage space underneath.
- SilentShield® sound-absorption technology offers quieter performance.
- Includes installation hardware and bottom basin rack.
- Material
- Handcrafted from 18-gauge stainless steel.
- Installation
- Top-mount or under-mount.

Simplice® single-hole or three-hole kitchen sink faucet with 15-3/8" pull-down spout



K-597-CP

An innovative fit for a variety of kitchens and tasks, this Simplice bar or prep sink faucet combines an elegant, universal design with exceptional ergonomics and functionality. The high-arch swing spout rotates 360 degrees, while the smoothly maneuvering sprayhead pulls down into the sink for up-close tasks, or out of the sink to fill pots. Sculpted buttons on the sprayhead ensure simple operation even with wet, soapy hands.

Dimensions

Height 15-3/8"
 Length 8"
 Width 8"

Features

- Single handle is simple to use and makes adjusting water temperature easy.



- High-arch gooseneck spout and 360-degree spout rotation offer superior clearance for filling pots and cleaning.
- Three-function pull-down sprayhead with touch-control allows you to switch from stream to spray to pause.
- ProMotion™ technology's light, quiet nylon hose and ball joint make the pull-down sprayhead easier and more comfortable to use.
- MasterClean™ sprayface features an easy-to-clean surface that withstands mineral buildup.
- Temperature memory allows faucet to be turned on and off at the temperature set during prior usage..
- Ceramic disc valves exceed industry longevity standards, ensuring durable performance for life.
- Material
- Premium metal construction.
- KOHLER finishes resist corrosion and tarnishing.
- Installation
- Single-hole or three-hole installation (escutcheon included).
- Flexible supply lines and installation ring simplify installation.



DIVISION 11 – EQUIPMENT

SECTION 11 31 13 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.01 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Regulatory Requirements: Comply with provisions of the following product certifications:

1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
2. UL and NEMA: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.
3. NAECA: Provide residential appliances that comply with NAECA standards.

PART 2 – PRODUCTS



Room	Appliance														
Living Room															
	TV	Manufacturer	Model #	Size (Diagonal)	Type	Smart	Wifi	microphone	camera	app	Energy Star	watts	kWh/yr	price	
		Samsung	UN46ES8000FXZA	46"	Ultra Slim LED	Yes	Yes	voice recognition	gesture recognition	remote/stream/video	Exceeds Standards	76	139	\$2,119	
	Surround Sound	Manufacturer	Model #												
		Sony	BDVN890W									1000		\$799	
Kitchen															
	Refrigerator	Manufacturer	Model #	Configuration	Defrost Type	Compact	Thru-Door Ice	Total Volume (ft3)	Adjusted Volume (ft3)				(kWh/yr)	Price	
		Whirlpool	GB9FHDXWS	Bottom Freezer	Automatic		No	19					392	\$1,599	
	Microwave	Manufacturer	Model #	Size	Cooking Power										
		Samsung	SMH1816S	1.8 cu. ft	1100 watts										\$320.00
	Stove	Manufacturer	Model #	Size	Control Type										
		LG	LSC1307ST	30"											
	Oven	Organization Name	Brand Name	Model Name	Model Number	Product Type	Input Rate	Tested Door	Additional Door	Cooking Energy	Idle Energy Rate				
		Alto-Shaam, Inc.	Alto-Shaam	ASC-2E	ASC-2E	Half Size	Btu/h	kW	Type		Btu/h	kW			
							N/A	5.0	Glass	N/A	71%	N/A	0.8	\$3,500	
	Oven/Microwave	manufacturer	Model #												
		GE	PSB1201NSS	1.7 cu ft		Wall Oven									
	Dishwasher	Manufacturer	Model #	Size				(Gallons/Cycle)							
		Samsung	DMT800RHS	Standard											
Mechanical															
	Washer/Dryer	Manufacturer	Model #												
		LG	WM3455HS												
Studio															
	Computer	Manufacturer	Model #	Processor	RAM	Power Sup	Video Card	Motherboard	SSD	HDD					
		custom	custom	intel i7-3770	16GB DDR3	520W	Asus Radeon	Intel	128 GB	1TB					

36 inch Masterpiece® Series Freedom® Induction Cooktop

CIT36XKB

 **Thermador**★

INNOV ATION

- Largest fully usable cooking surface on the market.
- 48 induction elements deliver more than 63% usable cooking surface than the competition.
- Place up to 4 pots or pans anywhere on the cooktop surface in any configuration.
- Featuring the first full color touchscreen induction user interface on the market. This intuitive interface offers better control and faster access to cooking settings.
- Freedom to move. If you need to move your pot to another location, the cooktop will transfer all of your programmed settings to the new position of the pan.

PERFORMA NCE

- Most powerful element in its class with a 4,600 W PowerBoost™ lets you boil water faster than with any other cooking technology.
- Speed Heating - Induction cooktops heat 50% faster than traditional gas cooktops
- Pan Recognition - Element will not turn on if other small objects are placed on the cooking zone
- Anti-Overflow System - exclusive feature shutting off the relevant element and sounding alarm when liquids are detected on user interface
- Child Safety Lock

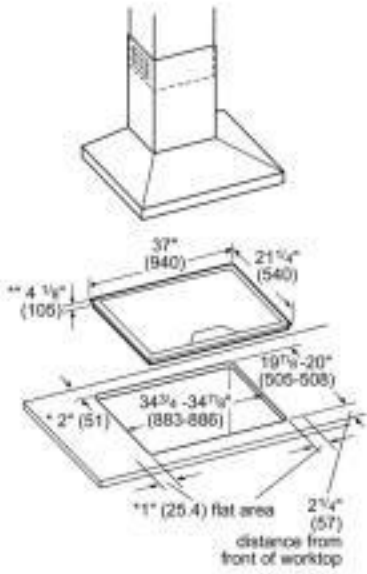


**D
e
s
i
g
n**

- Grey-black glass color
- Angular, modern design coordinates with the suite of Thermador Masterpiece™ Collection appliances
- Full stainless steel frame

Amps (A)	40
Frequency (Hz)	50; 60
Approval certificates	CSA
Plug type	No plug
Minimum distance from counter front	2 1/2"
Minimum distance from rear wall (in)	2 3/8"
Net weight (lbs)	69
Optional accessories	CHEFSPAN13, SENSORPOT6, SENSORPOT7, SENSORPOTH, TEPPAN1314, TEPPAN1321
Sealed burners	No
Dimension of 1st heating element (in)	21" X 13"
Power of 1st heating element (W)	3.6
Power of 1st heating element (kW in boost)	4.6
Location of 2nd heating element	back left
Location of 3rd heating element	back right
Location of 4th heating element	Cooking zone right

36 inch Masterpiece® Series Freedom® Induction Cooktop
 CIT36XKB



- * Minimum distance from cutout to the wall
- ** Recessed depth (includes 1" air clearance)

measurements in inches (mm in brackets)

1(800) 735-4328 | WWW.THERMADOR.COM | 1901 MAIN STREET, IRVINE, CA 92614
COPYRIGHT 2013 BSH HOME APPLIANCES CORPORATION, ALL RIGHTS RESERVED



SECTION 12500 - WINDOW TREATMENT

PART 1 GENERAL

1.01 DESCRIPTION:

A. Window treatment required for this work is indicated on the Drawings, and includes, but is not necessarily limited to Vertical Blinds.

NOTE: Window Treatment shall be provided at each, exterior window within the project area.

B. Related work described elsewhere includes: Carpentry (Section 06100), Glass and Glazing (Section 08800), Gypsum Drywall (Section 09250).

1.02 REFERENCES:

Flame-resistant fabrics shall pass or exceed one or more of the following tests:

National Fire Protection Association (NFPA) 701 (small scale for horizontal applications.)

Department of Transportation Motor Vehicles Safety Standard 302 Flammability of Interior Materials.

1.03 SUBMITTALS:

A. Product Data: Manufacturer's descriptive literature shall be submitted, indicating materials, finishes, construction and installation instructions and verifying that product meets requirements specified. Manufacturer's recommendations for maintenance and cleaning shall be included.

B. Drawings and Diagrams: Wiring diagrams of any motorized components or units, working and assembly drawings, and installation detail drawings shall be supplied.

C. Sample: One full-size shade of each type specified in this contract shall be supplied by the Contractor for approval by Architect and Owner. The supplied units shall be furnished complete with all required components, mounting and associated hardware, instructions and warranty.

1.04 QUALITY ASSURANCE:

A. Supplier: The manufacturer, subsidiary or licensed agent shall be approved to supply the products specified, and to honor any claims against the product presented in accordance with the warranty.

B. Installer: The installer or agent shall be qualified to install the specified products by prior experience, demonstrated performance. The installer shall be responsible for an acceptable installation.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Product shall be delivered to the site in manufacturer's original packaging.

B. Product shall be handled and stored to prevent damage to materials, finishes and operating mechanisms.



1.06 JOB CONDITIONS:

A. Prior to shade or fabric installation, building shall be enclosed.

B. Interior temperature shall be maintained between 60°F, and 90°F, during and after installation; relative humidity shall not exceed 80%. Wet work shall be complete and dry.

1.07 WARRANTY:

Minimum 3 years for material and installation.

PART 2 PRODUCTS

2.01 VERTICAL BLINDS: (PROVIDE WHERE INDICATED ON DRAWINGS.)

A. Manufacturer:

• HUNTER DOUGLAS

• LEVELOR

• SOLAR SHADING SYSTEMS

• or equal

B. Vertical Blinds: Thickness: .030", vinyl, and/or fabric construction, width: 3 1/2", overlap: 3/8" minimum. Length: Same as window height, unless shown otherwise. Architect will make selection from standard color range.

C. Operation: Manual by heavy duty cord, and plastic tilt rod.

D. Valence: Same color and material as vanes, mounted by wall brackets or ceiling attachments.

1. Inclusions: Bid price must include all materials and installation as a complete package.

1. Provide the window treatment at each, exterior window within the project area.

PART 3 EXECUTION

3.01 INSPECTION:

A. Contractor shall be responsible for inspection on site, approval of mounting surfaces, installation conditions and field measurement for this work.

B. Other interacting trades shall receive drawings of shade systems, dimensions, assembly and installation methods from contractor.

3.02 INSTALLATION:

A. Installation shall comply with manufacturer's specifications, standard, requirements and procedures.

B. Adequate clearance shall be provided to permit unencumbered operation of shades and hardware.



C. Clean finished installation of dirt and finger marks. Leave work area and clean and free of debris.

END OF SECTION

SECTION 12 35 30.13 - KITCHEN CASEWORK



PART 1 - GENERAL

1.01 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, and Material Samples.
- B. Verify dimensions by field measurements, measure for countertops after base cabinets are installed.

PART 2 - PRODUCTS

2.01 CASEWORK

A. Manufacturer: Décor Cabinet Company

1. <http://www.decorkit.com>

B. Comply with KCMA A161.1.

C. Cabinets:

1. Model: Talora
2. Face Style: Flush overlay
3. Cabinet Style: Frameless
4. Door and Drawer Fronts: Wood stiles and rails, with MDF core construction.
5. Door and Drawer Fronts: Laminate-faced particleboard
6. Exposed Cabinet End Finish: Countertop material
7. Door and Drawer Pulls: Inset flush pulls
8. Hinges: Concealed European-style self-closing hinges.
9. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides with nylon-tired, ball-bearing rollers.

10. Color: White

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install cabinets with no variations in flushness of adjoining surfaces by using concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit.



Provide filler strips, scribe strips, and moldings in finish to match casework face.

B. Install cabinets without distortion so doors and drawers fit openings properly and are aligned.

C. Install level and plumb to a tolerance of 1/8 inch in 8 feet (3.2 mm in 2.4 m).

D. Fasten each cabinet to adjacent unit and to structural members of wall construction.

Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches (600 mm) o.c.

1. Use No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or hanging strips.

2. Use toggle bolts through metal backing behind gypsum board.

END OF SECTION



DIVISION 14 – CONVEYING EQUIPMENT
DIVISION 21 – FIRE SUPPRESSION

SECTION 21 05 16 – FIRE PROTECTION PIPING PART 1 – GENERAL

1.1 SECTION INCLUDES:

- A. Pipe, fittings, valves, and connections for sprinkler systems.
- B. This section is to install a new fire sprinkler system for the building.
- C. The Contractor shall provide the sprinkler system in accordance with local code requirements and NFPA 13D. The drawings show the minimum requirements Contractor to provide and install any additional materials and equipment to meet local code requirements.

1.2 RELATED SECTIONS:

- A. Section 07 84 00 – Fire Stopping
- B. Section 09 91 00 – Painting.
- C. Section 23 05 53 – Mechanical Identification. D.
Section 21 13 13 – Sprinkler Systems.

1.3 REFERENCES:

- A. ASTM F438 – Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
- B. ASTM F439 – Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- C. ASTM F442 – Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).
- D. ASTM F493 – Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- E. NFPA 13D – Standard for the Installation of Sprinkler Systems in One- and Two- Family Dwellings and Manufactured Homes.

1.4 SUBMITTALS:

- A. Submit under provisions of Section 01 33 00 and 22 05 00.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- C. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.
- D. Manufacturer's Field Report: Submit under provisions of Section 01 45 00.
- E. Manufacturer's Field Report: Indicate time of start-up of treatment systems and include analysis of system water after cleaning and treatment.



1.5 OPERATION AND MAINTENANCE DATA:

- A. Submit under provisions of Section 01 78 23 and NFPA 13D.
- B. Maintenance Instructions: Include installation instructions, spare parts lists, procedures, and treatment programs.

1.6 QUALITY ASSURANCE:

- A. Sprinkler Systems: Perform work to NFPA 13D.
- B. Valves: Bear UL or FM] label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- C. Maintain one copy of each document on site.

1.7 EXISTING UTILITIES:

- A. The drawings indicate the locations, type and sizes of various utilities within the site where known. These utilities are indicated as accurately as possible. If the Contractor encounters any utilities or differing conditions during construction, which are not shown on the drawings, they shall request in writing for written instructions from the Architect and/or Engineer. Any relocation or remodeling required will then be directed by a change order. This Contractor shall assume all responsibility for protection of all utilities, shown or not, and for repair required by this construction.
- B. Contractor shall verify location, size, elevation, pressure and any other pertinent data of the existing utilities. The Contractor shall provide a written report with drawings indicating this existing utilities information, such as utility locations and water flow information. Additional costs incurred due to failure to verify such data and to coordinate associated work with respective utility providers shall not be the Owner's responsibility but shall be borne by the Contractor.
- C. All costs associated with providing utilities including, but not limited to, connection fees, meters, boring under roads, etc., shall be included in the Contractor's bid price whether such costs are incurred by Contractor or charged by the utility company.
- D. Submission of a bid by the Contractor shall be considered an acknowledgment by the contractor of his compliance with this section.
- E. The Contractor shall coordinate with Owner, Architect, and this Engineer's office any work that has the potential to hinder mechanical and plumbing services to areas outside this contract. All shut



downs or tie-ins relating to these systems shall be scheduled and submitted in writing to be approved by the Owner, Architect, and this Engineer's office. Contractor shall submit in writing a schedule of construction phasing that indicates areas of first priority during each phase and anticipated completion times. Schedules shall be submitted a minimum of 7 days prior to commencing work. Owner, Architect, and this Engineer's office shall review these schedules and notify the contractor of acceptance prior to commencement of work.

1.8 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver, store, protect, and handle products to site under provisions of Section 01 60 00. B. Deliver and store valves in shipping containers, with labeling in place.
- C. Provide temporary protective coating on cast iron and steel valves.

- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.9 REGULATORY REQUIREMENTS:

- A. Perform Work in accordance with State of Texas and City of El Paso Fire code. B. Conform to applicable code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

- D. At the end of warranty period the Contractor shall perform a Backflow Inspection per the requirements of the El Paso Plumbing Codes and shall turn a copy over to the Owner and a copy to El Paso Water Utility per their requirements.

PART 2 – PRODUCTS

2.1 SPRINKLER AND STANDPIPE PIPING, ABOVE GROUND: A. CPVC Pipe:
ASTM F442, SDR 13.5.

- 1. Fittings: ASTM F438 schedule 40, or ASTM F439 schedule 80, CPVC.
- 2. Joints: ASTM F493, solvent weld.

2.2 BALL VALVES: A.
Manufacturers:

- 1. NIBCO.
- 2. Milwaukee.
- 3. Stockham.
- 4. Red-White.

5. Refer to Sections 22 05 00 – General Mechanical Requirements: For Product options and substitutions.

B. Up to and including 2 Inches:
Bronze two piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle, and balancing stops, solder or threaded ends with union. 2.3

CHECK VALVES: A.

Manufacturers:

1. NIBCO.
2. Milwaukee.
3. Stockham.
4. Red-White.
5. Refer to Sections 22 05 00 – General Mechanical Requirements: For Product options and substitutions.

B. Up to and including 2 Inches: Bronze swing disc, solder or screwed ends.

2.4 DRAIN VALVES: A.
Manufacturers:

1. NIBCO.
2. Milwaukee.
3. Stockham.
4. Red-White.
5. Refer to Sections 22 05 00 – General Mechanical Requirements: For Product options and substitutions.

B. Bronze compression stop with hose thread nipple and cap. C. Brass ball valve with cap and chain, 3/4 inch hose thread.

PART 3 – EXECUTION

3.1 PREPARATION:

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and foreign material, from inside and outside, before assembly. C. Prepare piping connections to equipment with flanges or unions.

3.2 PROTECTION OF PENETRATION:

- A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.
- B. Contractor shall verify locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

3.3 INSTALLATION: A. Install piping in accordance with NFPA 13D for sprinkler systems.

- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, and not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- G. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 09 00 00.
- H. Do not penetrate building structural members unless indicated.
- I. Provide sleeves when penetrating floors, ceilings, and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- J. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.
- K. Provide ball valves for shut-off or isolating service.
- L. Provide drain valves at main shut-off valves, low points of piping and apparatus.

3.4 TESTS:

- A. Tests shall be complete prior to final inspection and prior to covering with insulation or earth.
- B. All pressure tests shall be charted using a stripe chart recorder with enough paper for the duration of the test shown. Refer to other specifications for additional requirements. The test results shall include test run, test date, person doing the testing, and Engineer or authority having jurisdiction signature.
- C. Hydraulically test fire protection per NFPA 13D requirements.
- D. Refer to Section 22 05 00 – General Mechanical Requirements for additional information.

END OF SECTION 21 05 16

SECTION 21 13 13 – SPRINKLER SYSTEMS PART 1 – GENERAL**1.1 SUMMARY:**

- A. The Contractor shall provide the sprinkler system in accordance with local code requirements and NFPA 13D. The drawings show the minimum requirements Contractor to provide and install any additional materials and equipment to meet local code requirements.

1.2 SECTION INCLUDES:

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.

1.3 RELATED SECTIONS:

- A. Section 23 05 53 – Mechanical Identification.

1.4 REFERENCES:

- A. NFPA 13D – Standard for the Installation of Sprinkler Systems in One- and Two- Family Dwellings and Manufactured Homes.

1.5 SYSTEM DESCRIPTION:

- A. System to provide coverage for entire building.
- B. Provide system to NFPA 13D hazard occupancy requirements.

1.6 SUBMITTALS:

- A. Submit under provisions of Sections 01 33 00 and 22 05 00.
- B. Preliminary Shop Drawings: Prior to detailed submission, submit preliminary layout of finished ceiling areas indicating only head locations coordinated with ceiling installation.
- C. Shop Drawings: Indicate hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories. Indicate system controls.
- D. Product Data: Provide data on sprinkler heads, valves, and specialties, including manufacturer's catalogue information. Submit performance ratings rough-in details, weights, support requirements, and piping connections.
- E. Submit shop drawings, product data, and hydraulic calculations to City of El Paso Building Services and Owner's insurance underwriter] for approval. Submit proof of approval to Architect/Engineer prior to installation of system. F. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

1.7 PROJECT RECORD DOCUMENTS:

- A. Submit under provisions of Sections 01 78 39 and 22 05 00.



- B. Record actual locations of sprinkler heads and deviations of piping from drawings. Indicate drain and test locations.
 - C. At the end of warranty period the Contractor shall perform a Backflow Inspection per the requirements of the El Paso Plumbing Codes and shall turn a copy over to the Owner and a copy to El Paso Water Utility per their requirements.
- 1.8 OPERATION AND MAINTENANCE DATA:
- A. Submit under provisions of Sections 01 78 23 and 22 05 00.
 - B. Maintenance Data: Include components of system, servicing requirements, Record Drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- 1.9 QUALITY ASSURANCE:
- A. Perform Work in accordance with NFPA 13D.
 - B. Equipment and Components: Bear UL or FM label or marking. C. Maintain one copy of document on site.
- 1.10 QUALIFICATIONS:
- A. Installer: Company specializing in performing work of this Section with minimum three documented year's experience.
 - B. Design sprinkler system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State of Texas.
- 1.11 REGULATORY REQUIREMENTS:
- A. Hydraulic Calculations, Product Data, and Shop Drawings: Bear stamp of approval of authority having jurisdiction.
- 1.12 DELIVERY, STORAGE, AND HANDLING:
- A. Deliver, store, protect, and protect products to site under provisions of Section 01 65 00
 - B. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.
- 1.13 EXTRA MATERIALS: A. Furnish under provisions of Sections 01 78 46 and 22 05 00. B. Provide extra sprinkler heads under provisions of NFPA 13D. C. Provide suitable wrenches for each head type.
- D. Provide metal storage cabinet in location designated. PART 2 –

PRODUCTS

2.1 MANUFACTURERS:

- A. Central Sprinklers Corp.
- B. Grinnell Fire Protection Systems. C. Viking Corp.
- D. Star Sprinkle Corp.
- E. Substitutions: Under provisions of Sections 01 60 00 and 22 05 00.

2.2 SPRINKLER HEADS: A. Suspended

Ceiling:

- 1. Type: Standard pendant type with matching push on or clamp on or screw on escutcheon plate.
- 2. Head Finish: Chrome plated.
- 3. Escutcheon Plate Finish: Chrome plated.
- 4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

2.3 PIPING SPECIALTIES:

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate electrically operated alarms, with pressure retard chamber and variable pressure trim.
- B. Electric Alarm: Electrically operated red enameled gong with pressure alarm switch.
- C. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts rated 10 amp at 115 volt AC.

PART 3 – EXECUTION

3.1 PREPARATION:

A. Coordinate work of this Section with other affected work. 3.2 INSTALLATION:

- A. Install equipment in accordance with manufacturer's instructions.
- B. Locate outside alarm gong on building wall as indicated on drawings. C. Place pipe runs to minimize obstruction to other work.
- D. Place piping in concealed spaces above finished ceilings.



- E. Apply masking tape or paper cover to ensure concealed sprinkler head cover plates do not receive field paint finish.
- F. Hydrostatically test entire system.
- G. Require test be witnessed by Authority having jurisdiction and Architect/Engineer.
- H. At the end of warranty period the Contractor shall perform a Backflow Inspection per the requirements of the El Paso Plumbing Codes and shall turn a copy over to the Owner and a copy to El Paso Water Utility per their requirements.

3.3 TESTS:A. Tests shall be complete prior to final inspection and prior to covering with insulation or earth.B. All pressure tests shall be charted using a stripe chart recorder with enough paper for the duration of the test shown. Refer to other specifications for additional requirements. The test results shall include test run, test date, person doing the testing, and Engineer or authority having jurisdiction signature.

- C. Hydraulically test fire protection per NFPA 13D.
- D. Refer to Section 22 05 00 – General Mechanical Requirements for additional information.

3.4 SPRINKLER HEAD TYPES:

- A. The sprinkler head shall conform to the following initial type classifications: Location

Sprinkler Head Type	
Building	Pendent

END OF SECTION 21 13 13



SECTION 21 27 00 - FIRESTOPPING

PART 1 GENERAL

1.01 DESCRIPTION:

A. Provision and application of Firestopping is typically not specifically indicated on the drawings, but shall be provided wherever penetrations - vertically and horizontally - are made through fire rated wall, floor, ceiling assemblies, during the construction of this project. The rated assemblies may be new or existing. The workscope may include, but is not limited to:

Through penetration firestops and smoke stops for all fire-rated bearing and non-bearing walls and floors.

Membrane penetration protection for fire-rated walls.

Architectural/Construction joint firestops within walls, floors, or the intersection of floors to exterior walls, or the intersection of top of walls to ceilings.

Top of wall firestopping in all fire-rated partitions.

Top of wall and construction joint smoke-stopping in all smoke partitions.

B. Related Sections: Proper execution of this work shall maintain the hourly ratings of the walls and floors and ensure progress of work in other Sections. Coordinate work of this Section with the work of the following Sections: Concrete Work (Section 03310), Brick Masonry (Section 04200), Sealants (Section 07900), Lath and Plaster (Section 09200), and Gypsum Drywall (Section 09250).

1. Firestopping for penetrations related to work in Division 15, 16 and 17, may be provided under those contracts, or this section, however, the General Contractor, will be held responsible for necessary firestopping provisions for all new penetrations. The Owner, will not allow additional cost for this coordination requirement.

1.02 REFERENCES:

1. American Society for Testing and Material Standards (ASTM)

ASTM E 814: *Standard Test method for Fire Tests of Through-Penetration Firestops.*

ASTM E84: *Standard Test Method for Surface Burning Characteristics of Building Materials.*

1.02 REFERENCES (CONTINUED):

B. Underwriters Laboratories, Inc.:

UL 1479 *Fire Tests of Through-Penetration Firestops*

UL 723 *Surface Burning Characteristics of Building Materials*

1. UL Fire Resistance Directory:



Through Penetration Firestop Devices (XHJI)

Fire Resistive Ratings (BXUV)

Through Penetration Firestop Systems (XHEZ)

Fill, Void, or Cavity Material (XHHW)

1.03 DEFINITIONS:

1. FIRESTOPPING: The use of a material or combination of materials in a fire-rated structure (wall or floor), where it has been breached, so as to restore the integrity of the fire rating on that wall or floor.
1. SYSTEM: The use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction type and a specific penetrant(s), constitutes a "System".
1. BARRIER: Any bearing or non-bearing wall or floor, that has an hourly fire and smoke rating.
1. THROUGH-PENETRATION: Any penetration of a fire rated wall or floor, that completely breaches the barrier.
1. MEMBRANE-PENETRATION: Any penetration in a fire-rated wall that breaches only one side of the barrier.
1. CONSTRUCTION GAPS: Any gap, joint, or opening, whether static or dynamic, where the top of a wall may meet a floor; wall to wall applications; edge to edge floor configuration; floor to exterior wall; or any linear breach in a rated barrier. Where movement is required, the firestopping system must comply with UL2079 for dynamic joints.

1.04 SCOPE INCLUSIONS:

1. This section describes requirements for furnishing and installing firestopping for fire-rated construction. This includes, but is not limited to:

All through-penetrations in fire-rated floors and wall assemblies, both blank (empty) and those accommodating penetrating items such as cables, conduits, pipes, ducts, etc.

All membrane -penetrations on fire-rated walls.

1.04 SCOPE INCLUSIONS (CONTINUED):

Gaps (openings) between exterior curtain walls, the outer perimeter edge of the structural floors, top of wall, wall to wall, floor to floor, and any other linear opening that is considered fire-rated.

Repair of existing fire and/or smoke partitions to restore required overall ratings of existing walls.

Openings at each floor level in shafts or stairwells.

1.05 SUBMITTALS:

1. Submit manufacturer's product literature for each type of firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance and limitation criteria, and test data. Submittal should be in compliance with Section 01300 - Submittals.
1. Material Safety Data Sheets (MSDS): Submit MSDS for each firestop product.
1. UL Tested Systems: Submit drawings showing typical installation details for the methods of installation. Indicate which firestop material will be used and the thickness for different hourly ratings.
1. Engineering Judgments: Submit manufacturer's drawings for all non-standard applications where no UL tested system exists. All drawings must indicate the "Tested" UL system upon which judgment is based so as to assess the relevance of the judgement to some known performance.
1. Submit manufacturer's installation procedures for each type of product.
1. Approved Applicator: Submit document from Firestop Manufacturer, wherein Manufacturer recognizes the installer as qualified or submit a list of past projects to demonstrate capability to perform intended work.
1. Upon completion, installer shall provide written certification that materials were installed in accordance with the manufacturer's installation instructions and details.

1.06 QUALITY ASSURANCE:

1. Firestopping systems (materials and design):

Shall conform to both Flame (F) and Temperature (T) ratings as required by local building codes and as tested by nationally accepted testing agencies as per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.

1.06 QUALITY ASSURANCE (CONTINUED):

The F rating must be a minimum of one (1) hour, but not less than the fire resistance rating of the assembly being penetrated. T rating when required by code authority shall be based on measurement of the temperature rise on penetrating items(s), The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.

For joints, must be tested to UL2079 with movement capabilities equal to those of the anticipated conditions.

1. Firestopping materials and systems must be capable of closing or filling through-openings created by 1) the burning or melting of combustible pipes, cable jacketing, or pipe insulation materials, or 2) deflection of sheet metal due to thermal expansion (electrical & mechanical) ductwork).
1. Firestopping material shall be asbestos and lead free and shall not incorporate nor require the use of hazardous solvents.
1. Firestopping sealants must be flexible, allowing for normal pipe movement.

1. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces.
1. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.
1. All firestopping materials shall be manufactured by one manufacturer (to the maximum extent possible).
1. Installation of firestopping systems shall be performed by a contractor (or contractors) trained and approved by the firestop manufacturer.
1. Materials used shall be in accordance with the manufacturer's written installation instructions.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING:

1. Deliver material in the manufacturer's original, unopened containers or packages with the manufacturer's name, product identification, lot number, UL label, and mixing and installation instructions as applicable.
1. Store materials in original, unopened containers or packages, and under conditions recommended by the manufacturer.
1. All firestop materials shall be installed prior to the expiration of shelf life.

1.08 PROJECT CONDITIONS:

1. Conform to manufacturer's printed instructions for installation and when applicable, curing in accordance with temperature and humidity. Conform to ventilation and safety requirements.
1. Verify the condition of the substrates before starting the work.
1. Weather Conditions: Do not proceed with installation for firestop materials when temperatures fall outside the manufacturer's suggested limits.
1. Care should be taken to ensure that firestopping materials are installed so as not to contaminate adjacent surfaces.

1.09 SEQUENCING:

1. Coordinate installation for firestopping materials with trades specified in 1.01.B, or as applicable for the project.
1. Schedule firestopping after installation of penetrants but prior to concealing the openings.
1. Firestopping shall precede gypsum board finishing.

1.10 PROTECTION:



Where firestopping is installed at locations which will remain exposed in the completed work, provide protection as necessary to prevent damage to adjacent surfaces and finishes, and protect as necessary against damage from other

construction activities.

PART 2 - PRODUCTS

2.01 GENERAL:

1. Firestopping materials and systems shall meet the requirements specified herein.
1. Architect must approve in writing any alternates to the materials and systems specified herein.
1. All firestop products and systems shall be designed and installed so that the basic sealing system will allow the full restoration of the thermal and fire resistance properties of the barrier being penetrated with minimal repair if penetrants are subsequently removed.
1. For applications where combustible penetrants are involved, i.e. insulated and plastic pipe, a suitable intumescent material must be used.

2.02 ACCEPTABLE MANUFACTURERS:

Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II, of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. **SPECIFIED TECHNOLOGIES**, Inc/GE PensilÂ® (STI), Somerville, NJ 08876, Phone (800) 992-1180.
1. **3M FIRE PROTECTIONS PRODUCTS/DOW CORNING**, St. Paul, MN.
1. **IPC (INTERNATIONAL PROTECTIVE COATINGS CORP.)**, Ocean Twp., New Jersey

Phone: 1-800-334-8796

1. **HILTI CONSTRUCTION CHEMICALS, INC.**, Tulsa, Oklahoma.

Phone: (918) 252-6901

2.03 MATERIALS:

1. Intumescent Firestop Sealants and Caulks:

STI SpecSeal S100 and S500 Sealant

3M Fire Barrier Caulk CP25WB+

1. Latex Firestop Sealant:

STI SpecSeal LC150 Sealant



1. Silicone Firestop Sealants and Caulks:

STI SpecSeal Pensil 300

3M Fire Barrier Silicone Sealants

1. Firestop Putty:

STI SpecSeal Firestop Putty Bars and Pads

3M Fire Barrier Moldable Putty

1. Firestop Collars:

STI SpecSeal Firestop Collars

3M Fire Barrier PPD™s

1. Wrap Strips:

SpecSeal Wrap Strip

3M Fire Barrier FS195 Wrap Strip

1. 2-Part Silicone Firestop Foam:

STI SpecSeal Pensil 200

3M Fire Barrier 2001 Silicone Foam

2.03 MATERIALS (CONTINUED):

1. Firestop Mortar:

STI SpecSeal Mortar

I Firestop Pillows:

STI SpecSeal Pillows

1. Composite Board:

3M Barrier Sheet Material

1. Forming/Damming Materials:

Mineral fiberboard or other type as per manufacturer recommendation.

PART 3 - EXECUTION

3.01 INSPECTION:

1. Examine the areas and conditions where firestops are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until satisfactory conditions have been corrected by the contractor in a manner acceptable to the Architect.
1. Verify that environmental conditions are safe and suitable for installation of firestop products.

3.02 CONDITIONS REQUIRING FIRESTOPPING:

1. General: Provide firestopping for conditions specified whether or not firestopping is indicated, and if indicated, whether such material is designed as insulation, safing, or otherwise.
1. Through-Penetrations: Firestopping shall be installed in all open penetrations and in the annular space in all penetrations in any bearing or non-bearing fire-rated barrier.
1. Membrane-Penetrations: Where required by code, all membrane-penetrations in rated walls, shall be protected with firestopping products that meet the requirements of third party time/temperature testing:
 1. Construction Joint/Gaps:

Firestopping shall be provided:

- a. between the edges of floor slabs and exterior walls
- b. between the tops of walls and the underside of floors
- c. in the control joint in masonry walls and floors
- d. in expansion joints

3.02 CONDITIONS REQUIRING FIRESTOPPING: (CONTINUED)

1. Smoke-Stopping: As required by the other Sections listed in 1.01, B "Related Sections", Smoke-Stops shall be provided for Through-Penetrations, Membrane-Penetrations, and Construction Gaps with material approved and tested for such application.

3.03 INSTALLATION:

1. GENERAL:

Installation of firestops shall be performed by an applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.

Apply firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations.

Coordinate with plumbing, mechanical, electrical and other trades to assure that all pipe, conduit, cable, and other items which penetrate fire-rated construction have been permanently installed prior to the installation of



firestops. Schedule and sequence the work to assure that partitions and other construction which would conceal penetrations are not erected prior to the installation of firestops.

Unless specified and approved, all insulation used in conjunction with through-penetrations, shall remain intact and undamaged and may not be removed.

Seal holes and penetrations to ensure an effective smoke seal.

In areas of high traffic, protect firestopping materials from damage. If the opening is large, install firestopping materials capable of supporting the weight of a human.

Insulation types specified in other Sections, shall not be installed in lieu of firestopping material specified herein.

All combustible penetrations (e.g. non-metallic pipes or insulated metallic pipes) shall be firestopped using products and systems tested in a configuration representative of the field condition.

1. Dam Construction: When required to properly contain firestopping materials within openings, damming or packing materials may be utilized. Combustible damming material must be removed after appropriate curing. Noncombustible damming material may be left as a permanent component of the firestop system.

3.04 FIELD QUALITY CONTROL:

1. Prepare and install firestopping systems in accordance with manufacturer's printed instructions and recommendations.
1. Follow safety procedures recommended in the Material Safety Data Sheets.
1. Finish surfaces of firestopping which are to remain exposed in the completed work to a uniform and level condition.
1. All areas of work must be accessible until inspection by the applicable Code Authorities.
1. Correct unacceptable firestops and provide additional inspection to verify compliance with this specification at no additional cost.

3.05 CLEANING:

1. Remove soiled and excess materials adjacent to firestopping without damaging adjacent surfaces.
1. Leave finished work in neat, clean condition, with no evidence of spill overs or damage to adjacent surfaces.

3.06 MATERIAL COMPLIANCE:

Work in this section of the specifications shall be covered by Section 01060 - Codes and Standards. If conflict exists between products and methods herein specified and the section noted above, notify the Architect before bidding.

END OF SECTION



DIVISION 22 – PLUMBING

SECTION 22 05 00 – GENERAL MECHANICAL REQUIREMENTS PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings, General Conditions of the Contract for Construction, Supplementary Conditions and Division 1 – General Requirements apply to work of this section.

1.2 DESCRIPTION:

- A. Work covered by this Division shall consist of furnishing all labor, equipment, supplies and materials and in performing all operations necessary for the installation of complete and operating mechanical systems as required by these specifications and/or shown on the drawings, subject to the terms and conditions of the contract. The work shall also include the completion of such mechanical and electrical details not mentioned or shown which are necessary for the successful operation of all systems described on the drawings or required by these specifications; this includes the furnishing all materials for the filling the systems to make them operable, including water, refrigerant, oil and grease. Prove satisfactory operation of all equipment and controls to the Engineer on request.

- B. Work not included – Certain labor, material and equipment may be furnished and/or installed under other divisions of these specifications. This Contractor shall coordinate with other trades and arrange his work to make the parts fit together. The following items are to be accomplished under other divisions of these specifications:

1. Temporary Heat: Refer to paragraph in this Section.
2. Temporary Water and Toilet: Refer to General Conditions.
3. Electrical Equipment and Wiring: Refer to paragraph in this Section.
4. Concrete: Refer to paragraph in this Section.

- C. Equipment Furnished by Owner – Rough-in services pipes to locations as required by architectural and mechanical drawings and equipment shop drawings. Provide service valves on all pipes except waste and vent pipes. Plug and cap all waste and vent pipes. Final Connection to equipment will be made by this Contractor.

1.3 BIDDING:

- A. All mechanical equipment shall be new unless specified otherwise in the specifications or on the drawings.



- B. All bids must be based only on the equipment and materials as scheduled on the drawings and as specified or on equivalent equipment and materials from a preapproved alternative manufacturer. No bid may be based on a substituted or other alternative without specific written prior approval from the Engineer. Any Contractor who assumes equivalence of products and who bases his bid on that assumption does so at his own risk.
- C. A listing of approved alternative manufacturers does not mean that all products of a particular alternative manufacturer are acceptable alternative to the scheduled items; it merely means that for bidding prior approval is not required. All fixtures and devices must still be submitted according to the prescribed procedures. In addition, some items that have an important visual affect, e.g. electric water coolers, may be required to receive Owner's or Architectural approval also.

1.4 EXISTING UTILITIES:

- A. The drawings indicate the locations, type and sizes of various utilities within the site where known. These utilities are indicated as accurately as possible. If the Contractor encounters any utilities or differing conditions during construction, which are not shown on the drawings, they shall request in writing for written instructions from the Architect and/or Engineer. Any relocation or remodeling required will then be directed by a change order. This Contractor shall assume all responsibility for protection of all utilities, shown or not, and for repair required by this construction.

1.5 CODES, PERMITS AND FEES:

- A. Contractor shall comply with all local, state and national codes and shall pay for all applicable costs, meter costs, fees, permits, licenses and inspections for this division
- B. The mechanical work shall be performed in strict accordance with the applicable and Adopted provisions of the International Building Code International Plumbing Code, International Mechanical Code and International Energy Conservations Code as adopted and interpreted by the State of Texas, City of El Paso and the National Fire Protection Association (NFPA) regulations, current adopted edition regarding mechanical systems, fire systems and electrical systems. All materials and labor necessary to comply with Rules, regulations and ordinances shall be provided. Where the drawings and/or Specifications indicate materials or construction in excess of code requirements, the Drawings and/or specifications shall govern. The contractor shall hold and save the Owner, Architect and Engineers free and harmless from liability of any nature or kind Arising from his failure to comply with all applicable codes and ordinances.

1.6 TEMPORARY HEAT:

- A. Temporary heat will be furnished by the General Contractor. Use of the permanent heating system will not be allowed without written authorization from the Engineer, Architect and Owner. In

case the permanent heating system is used for temporary heat, the General Contractor shall pay all the costs until acceptance by the Owner. Warranty of equipment shall not start until acceptance by the Owner.

1.7 DRAWINGS:

- A. Contract drawings are diagrammatic only and are not intended to be scaled for dimensions. All dimensions shall be taken from Architectural drawings, certified equipment drawings and from the structure itself before fabricating and work. All space requirements shall be verified, coordinated with other trades, as it is the various Contractors' responsibility to install the systems complete in the space provided without extra charges to the Owner.
- B. It is intended that anything, including labor and materials, which is usually furnished as part of any equipment specified and which is necessary for operation shall be furnished as part of the Contract without additional cost, whether or not shown or described.
- C. All piping in finished areas of the building shall be concealed except where otherwise noted on the drawings.
- D. All equipment shall be installed in accordance with manufacturer's recommendations, unless approval is given in writing by the Consulting Mechanical Engineer for deviation prior to commencement of work.

1.8 REQUIREMENTS OF REGULATORY AGENCIES:

- A. The mechanical work shall be performed in strict accordance with the local and state codes, ordinances, and regulations governing the particular work involved. Furnish, without extra charge, any additional material and labor when and where required to comply with these Rules and Regulations, though the work is not mentioned in the Specifications or shown on the Drawings. When the Specifications or Drawings call for or describe materials or construction of a better quality or larger sizes than required by the above mentioned Rules and Regulations, the provisions of these Specifications and accompanying Drawings shall take precedence.

1.9 QUALIFICATIONS:

- A. All mechanics shall be capable journeymen, apprentices, or helpers, skilled in the work assigned to them with licensing required by the inspecting authority. All welders must have been certified within the past three years to perform the work, which they are doing.

1.10 WARRANTY:

- A. All materials and equipment shall be new unless otherwise specified.

- B. Guarantee all workmanship, material and equipment and replace any found defective without cost to the Owner, for ONE year after final acceptance, as defined in General Conditions.
- C. Each warranty for longer than one year as described above (that comes with equipment used on the job) shall be passed into the Owner in the Operation and Maintenance Manual, along with the dates of start and end of warranty.
- D. Refer to General Conditions for additional information regarding specific warranty requirements.

1.11 PROJECT RECORD DOCUMENTS:

- A. Before final payment, provide the Architect with one clean set of drawings and specifications corrected up-to-date as job progress. These documents shall reflect the As-Built conditions. Refer to General Conditions for additional information.

1.12 SUBMITTALS:

- A. The intent of this section is to give general submittal information, refer to specific submittal information in the subsequent mechanical sections. B. Within 10 days after award of the contract, and before orders are placed, Contractor shall submit specific information on list of equipment and principal materials specified. Contractor shall indicate and/or provide names of manufacturers, catalog and model numbers, cut sheets, and such other supplementary information as necessary for evaluation. Minimum of six (6) copies, or as directed by the Engineer, of each shall be submitted and shall include all items mentioned by model number and/or manufacturer's name in the specifications or in schedules on the drawings.
- C. Requirements for each submittal:
 - 1. Bear a dated stamp or specific written indication that the Contractor has reviewed and approved all submittal prior to submission to Engineer,
 - 2. Have all information deleted by Contractor that pertains to the means and methods of construction or to fabrication, assembly, installation, or erection (approval by Engineer shall not extend to these areas unless specifically noted by Engineer),
 - 3. **BE CLEARLY AND SPECIFICALLY** marked as to which specific piece of equipment is being submitted, by use of a permanent marker, stamp, etc., so as to distinguish it from other pieces of equipment that may occur on the same page,
 - 4. **BE CLEARLY AND SPECIFICALLY** marked as to which available options are being submitted that are associated with a piece of equipment, and

5. Be complete with respect to quantities, dimensions, specific performance, materials, and similar data to enable the Engineer to review the proposed equipment.
 6. Omission by Contractor of any of the above requirements or submittals will subject submittal to automatic rejection without review.
 7. Any submittals received by Engineer that were not requested shall be returned without review of any kind.
 8. Submittals shall indicate minimum access and service clearances if required by the submitted equipment.
- D. Installation Instructions – For certain products or systems as identified in subsequent specifications sections or on the drawings, the Contractor shall be required to provide copies of manufacturer's installation instructions with the submittal. When required as such, the installation instructions are considered part of the submittal and their omission may result in automatic rejection of the submittal. Where more than one identical device are scheduled, only one set of installation instructions needs to be submitted, e.g. if seven five-ton split systems air conditions are scheduled, only one five-ton unit installation instruction needs to be submitted. Similarly, if one set of installation instructions is identified by the manufacturer and on the instructions to be applicable to more than one type or size of devices, e.g. if one set of air conditioner instructions is good for three, four, five-ton units, then only one instruction set is required for these devices.
- E. This Engineer will review the submittals for approval twice. Any additional reviews that are required by the engineer for whatever reason after the initial two reviews will result in additional compensation for the Engineer's time by the submitting Contractor at the Engineer's rate.
- 1.13 PRIOR APPROVAL OF SUBSTITUTED PRODUCTS:
- A. Material or equipment specified by Manufacturer's name and model number is being used as a basis of standard and performance. No substitution is allowable without Engineer's written approval **FOURTEEN (14) DAYS PRIOR TO BID DUE DATE** unless the manufacturer is listed on the drawings or in the specification as being a preapproved alternative manufacturer.
- B. A prior approval submittal package shall at a minimum consist of the following items:
1. One copy of the product submittal in accordance with the paragraph in this section titled SUBMITTALS.
 2. Plan layouts sketches of mechanical rooms or systems of the substituted equipment showing that the proposed equipment will fit within the space allocated with the manufacturers and code required clearances for the substituted equipment as well as the other equipment in the space.
 3. Indications of any structural modifications required for the proposed substitution, such as additional weight or opening size changes.



4. Indications of any electrical modifications required for the proposed substitution, such as changes in breaker sizes, wiring requirements.
 5. Indication of any deviations from the specified equipment or their performance.
- C. It shall be the Manufacturer and/or their authorized Representative's responsibility to verify that submitted substitute equipment will fit in space available. The Manufacturer and/or their authorized Representative's submittal for acceptance of the substitute shall include a written statement of whether or not such acceptance would require any subsequent or associated changes to the drawings or specifications. Any such changes shall be described in writing, briefly but complete.
- D. The Manufacturer and/or their authorized Representative's shall be responsible for the costs of any such modifications due to substitution of materials or equipment for that which was specified or scheduled. The cost shall be complete, that is, it shall include the cost affect of any and all other trades.
- 1.14 SUBSTITUTED PRODUCTS:
- A. Material or equipment specified by Manufacturer's name is being used as a basis of standard. No substitution is allowable without Engineer's written approval ten (10) days prior to bid due date unless the manufacturer is listed on the drawings or in the specification as being a preapproved alternative manufacturer. Any submittal received without such written approval or prior approval is subject to unqualified rejection.
 - B. It shall be the Contractor's responsibility to verify that submitted substitute equipment will fit in space available. The contractor's submittal for acceptance of the substitute shall include a written statement of whether or not such acceptance would require any subsequent or associated changes to the drawings or specifications. Any such changes shall be described in writing, briefly but complete.
 - C. The Contractor shall be responsible for the costs of any such modifications due to substitution of materials or equipment for that which was specified or scheduled. The cost shall be complete, that is, it shall include the cost affect of any and all other trades.
 - D. The Engineer may request detailed shop drawing or plan layouts of mechanical rooms or systems of the substituted equipment.
- 1.15 SAFETY: A. General – Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work, and Contractor shall comply with all laws governing safety, specifically the "Occupational Safety and Health Standards" and the "Safety and Health Regulations for Construction", state and federal.

- B. According to OSHA, a hazardous chemical is any chemical, which is a physical hazard or a health hazard. This may include items such as paints, solvents, adhesives, sealants, cleaners, etc. If a contractor produces, uses, or stores hazardous chemicals at the workplace, then contractor shall develop, implement, and maintain a hazard communication program in compliance with the latest OSHA requirements. In projects with multiple tenants in which the building is partially occupied during all or part of the project, Contractor shall inform the building manager or Owner, according to OSHA guidelines, of any hazardous chemicals being produced, stored, or used in the building so that other tenants may be notified. Contractor shall employ required methods of training, information, handling, ventilation, labeling, storing, disposal, and removal of hazardous chemicals.

1.16 LABELING:

- A. Each device for which an independent testing authority has established a standard shall have affixed a label indicating its compliance and listing. Refer to General Conditions for list of such independent testing authorities.

1.17 SITE VISIT REPORTS:

- A. During the course of the job, the Engineer will make site visits to observe work in progress and will subsequently prepare a written site visit report, which will be sent to the Contractor and to whomever else the Engineer desires. The Contractor shall prepare a written and typed response within seven (7) calendar days of his receiving the site visit report. The Contractors shall accompany the Engineer during this final punchlist visit upon the request of the Engineer. The General Contractor shall include in his response the following information.

1. Date of site visit by the Engineer,
2. Date of receipt of the site visit report,
3. Name and title of the preparer of the response,
4. An item number referenced to the site report,
5. A brief three or four word description of the item,
6. The Contractor or Subcontractor affected,
7. The proposed course of action, and
8. An expected time of completion of the action.

1.18 FINAL PUNCH REPORTS:

- A. At the completion of the job, the Engineer will make punchlist site visits to observe completed work and will subsequently prepare a written site visit punchlist report, which will be sent to the Contractor and to whomever else the Engineer desires. The Contractor upon completion of the listed

punchlist items shall prepare a type written response to the list indicating completion of each item. The Contractor shall include in his response the resolution of each item. The Contractors shall accompany the Engineer during this final punchlist visit upon the request of the Engineer.

1.19 CUTTING AND PATCHING:

- A. No joists, beams, girders, columns, slabs, or other structural elements shall be cut, drilled, or altered in any way by the Contractor without first obtaining written permission and instructions from the Engineer and Architect.
- B. Where it is necessary to cut through any non-structural elements of walls, floors, or ceilings to permit the installation of any work under this contract, or to repair any defects that may appear up to expiration of the guarantee, such cutting shall be done by the Contractor with as little damage as reasonably possible to the element being cut or to adjacent elements.
- C. After the necessary work has been completed, the damage shall be repaired by the respective Contractor, who shall pay all costs of such cutting, repairs and patching. All patching or sealing of cuts and penetrations, including final appearance of same, shall be done to the approval of the Engineer and Architect.
- D. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

1.20 INSURANCE:

- A. The Contractor shall have required insurance. Required insurance shall be provided by this Contractor for protection against public liability and property damage for the duration of work.

1.21 CONFLICTS AND CORRECTION OF WORK:

- A. Promptly correct work rejected or failing to conform to the requirements of the Contract, whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear cost of correcting such rejected and nonconforming work including additional testing and inspections and including compensation for observing mechanical and electrical engineering firm's services and expenses made necessary thereby.
- B. If a conflict occurs on the bid documents, the Contractor shall contact the Architect's and Engineer's offices with a written request for clarification. If the conflict is un-resolvable at the time of bid, the most expensive interpretation of the conflict shall be bid so the conflict can be resolved in a deductive manner at a later time if necessary.

- C. If a conflict is discovered during construction, the Contractor shall stop work and that portion of the project and contact the appropriate party for clarification. The request for clarification shall be in written form. The Contractor shall bare the burden of replacing work that has been installed incorrectly as a result of a conflict on the drawings where he has not sought the Architect's and Engineer's guidance for clarification.
- D. If during construction a conflict is discovered between the drawings, the specifications, and/or the manufacturer's installation requirements the most stringent shall apply unless written clarification is obtained from the Engineer.

1.22 COORDINATION:

- A. In a timely manner, coordinated with all work involved for the following areas:
 - 1. Where new work of three or more trades or subcontractors is installed.
 - 2. Where new work is installed in existing areas.
 - 3. Where lead times are critical to the project schedule.
 - 4. Provide construction grade drawing as needed to acquire approval of work plan.
 - 5. Access or service spaces required for HVAC and plumbing equipment.
- B. Any occasion that requires the Engineer to be in attendance, the Contractor shall give the Engineer 24-hour notification.

PART 2 – PRODUCTS

2.1 MATERIALS:

- A. All materials shall be new and of specified quality, unless specifically noted otherwise. Materials shall be free from defects. Where manufacturer names are mentioned in the specifications or on the drawings, it has been done in order to establish a standard of quality and construction.
- B. Contractor will be responsible for transportation of his material to and from the job site, and will be responsible for the storage and protection of his materials and work until the final acceptance of the job. At the end of each day of work, each Contractor is responsible for covering or protecting his work and/or materials that may be susceptible to damage even if such damage is the result of unforeseen causes, e.g. an overnight thunderstorm. Failure to do so will be sufficient cause for rejection of any item in question, and any such item shall be replaced by Contractor at no cost to the Owner.



- C. Contractor shall verify that all pieces of equipment will fit through available openings in the building and that all equipment can be installed without modification of building structure.

2.2 EQUIPMENT SCHEDULE:

- A. All equipment major items are specified in the equipment schedules on the drawings and shall be new and furnished complete with all accessories normally supplied with the catalog item listed and all other accessories necessary for a complete and satisfactory installation.
- B. Equipment items so noted will require start-up by factory-trained personnel. Equipment items so noted will require factory approved service personnel who shall provide all service, including all parts and all labor, as requested by the Owner, during the full period of equipment warranty.

2.3 EQUIPMENT RATINGS:

- A. Equipment capacities as scheduled on the drawings are at project site altitude. Capacities of submitted equipment must be corrected for project site altitude unless otherwise noted.

2.4 WORKMANSHIP:

- A. The workmanship shall, in all respects, be of the highest grade, and all construction shall be done according to the best practices of the trade. Piping, ducting and conduit shall be concealed unless otherwise noted, and installed square to the building lines. Any work not meeting this requirement shall be replaced or rebuilt without extra expense to the Owner.

2.5 ELECTRICAL EQUIPMENT AND WIRING FOR ARCHITECTURAL AND MECHANICAL DIVISION:

- A. Responsibility
 - 1. Unless otherwise indicated, all motors, conduit, wiring, and controls (including temperature) shall be furnished, set in place, and wired in accordance with the following schedule. (MD is Mechanical Division AD is Architectural Division, and ED is Electrical Division)

MECHANICAL-ELECTRICAL ARCHITECTURAL COORDINATION



I T	FURNISHE D	SET IN PLACE OR MOUNTED UNDER	WIRED AND CONNECT ED UNDER
1. Equipment Motors and	M	M	E
2. Motor Controllers: magnetic starters, and	MD (1)	ED (1)	E
4. Pushbutton stations, thermostats, control relays, time clocks, control transformer control panels	M D	MD (2)	MD (2)
6. Fire Sprinkler System Control – Supervisory Panels and devices, including tamper	M D	MD(3)	E D
7. Plumbing Fixture Electrical	M	ED(1 & 3)	ED



Notes:

1. If furnished as part of factory wired equipment, wiring, conduit, and connection only be ED
2. If float switches, line voltage thermostats, PE switches, time switches etc., carry the FULL LOAD CURRENT of any motor, they shall be furnished by the Mechanical Division, but shall be set in place, wired and connected by the Electrical Division, except that where such items are and integral part of the mechanical equipment, or directly attached to ducts, piping, etc., they shall be set in place under the Mechanical Division and wired and connected by the Electrical Division. If they do not carry the FULL LOAD CURRENT to any motor they shall be furnished, set in place and wired under the Mechanical Division.
3. Wiring and conduit from alarm contacts to alarm system and conduit for control functions by ED; all control function wiring by MD.
4. Wiring and conduit from alarm contacts and kitchen equipment shutdown to kitchen fire suppression system by ED; all control functions by MD.
5. Architectural division to set in place, Mechanical Contractor to make mechanical connections and Electrical Contractor to make electrical connections.
 - B. Connections1. Connection to all control directly attached to ducts, piping and mechanical equipment shall be made with flexible connections not to exceed 3 linear feet.

2.6 ELECTRICAL WIRING AND CONTROL EQUIPMENT:

- A. All disconnects, motor starters, relays, wiring, conduits, etc. shall be provided by and comply with all requirements of 26 05 00 Sections of the electrical specifications.
- B. The Mechanical Contractor must refer to the electrical control equipment and wiring shown on the Electrical Drawings. Any changes or additions required by specified equipment furnished shall be the complete responsibility of the Contractor furnishing the equipment.
- C. All electrical equipment characteristics (voltage, phase, etc.) must be verified by the Contractor prior to ordering. It is imperative that voltage and phase characteristics are checked with the electrical drawings.
- D. All motors shall be built in accordance with the current applicable IEEE, ASA and NEMA standards. All general-purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. Motors shall be rated explosion-proof when located in hazardous atmospheres. Type II weather-protected motors may be used in lieu of TEFC motors on roof fan units and similar equipment. Motors mounted in direct sun shall be provided with a shield to forbid direct radiation from the sun when the sun is 45 degrees or greater above the horizon.



- E. Unless indicated otherwise, motors shall be NEMA design B with a service factor of 1.15 with 40°C rise and total temperature rise of 65°C ambient and when powered from the system voltage feeding the motor. TEFC motors shall have a service factor of 1.00 with total temperature rise of 65°C in the above conditions. Single-phase motors shall be NEMA Type N split phase induction motors with built-in thermal protectors. Single-phase motors connected on loads requiring high starting torque shall be capacitor-start induction motors F. All motors shall be all copper wound, high power factor, high efficiency motors. Electric motors shall be an energy efficient type as defined in the latest edition of NEMA document no. MG1. Motor efficiency shall be made available to the Engineer as required.

2.7 PROTECTION OF PENETRATION:

- A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.
- B. Contractor shall verify locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

2.8 EQUIPMENT AND PIPING SUPPORTS:

- A. All supporting systems for piping, equipment, and materials supported by the building structure shall be submitted to the Engineer for approval prior to purchase and installation.

2.9 ACCESSIBILITY: A. Access Panels

- 1. Access panels shall be provided wherever necessary for possible future replacement, adjustment, or maintenance of operating devices such as machinery, valves, dampers, switches, relays, plumbing fixtures such as trap primers and air gap fittings, or to other critical non-operating devices such as pull boxes, inspection parts, and gauges. Such access panels shall be provided and install by Contractor, whether or not shown on the drawings, and shall be brought to the attention of the Engineer for approval of type, color, fire rating. Where access is provided in rated members,, the access panels shall be of a type that maintains the integrity of the member penetrated

B. Access to Equipment

- 1. All pipes, tubing, conduit, etc. including, but not limited to, draining piping of any type, electrical conduit, wiring not in conduit, and pneumatic control tubing shall be installed in such a way so as not to prevent and/or not to make necessary difficult the removal, operation, use,



or maintenance of equipment, access panels or doors, pathways (especially in attics or crawlspaces), observation ports, measurement or balancing devices, junction boxes.

2. If access for these purposes is prevented or made unreasonably difficult in the opinion of the Engineer, then the Contractor shall make modifications or repairs at no cost to anyone except the Contractor. Such modifications or repairs shall be considered neither complete nor adequate until the Engineer is satisfied that access for the above purpose is achieved.

PART 3 – EXECUTION

3.1 STORAGE:

- A. Provide for proper storage of all materials and equipment and assume responsibility for losses due to any cause. All storage shall be within the contract limits of the building site or in a bonded warehouse. All equipment and materials must be covered and stored out of the elements; any item, which has become rusted, will not be permitted to be used.
- B. Each Contractor shall provide temporary storage facilities suitable for equipment stored at the job site. Storage facilities shall be rainproof and lockable as required. Materials or equipment stored on site but not in a lockable rainproof storage facility shall be stored above ground or above slab. Contractor shall take necessary precautions to prevent entry of and/or damage from dirt, trash, water, or vermin. Equipment not properly stored and protected shall be, at the discretion of the Engineer, replaced at no cost to the Owner. Roofs are not acceptable storage areas unless specifically allowed in writing by the Engineer.

3.2 INSTALLATION AND ARRANGEMENT:

- A. Install all work to permit removal (without damage to other parts) of coils, heat exchanger bundles, boiler tubes, fan shafts and wheels, filters, belt guards, sheaves and drives, plumbing fittings, and all other parts which might require periodic replacement or maintenance. Arrange pipes, ducts and equipment to permit ready access to valves, traps, starters, motors, control components and to clear opens of doors and of access panels.
- B. Offsets, transitions and changes in direction in pipes and ducts shall be made as required to maintain proper head room and pitch of sloping pipes whether or not indicated on the drawings. Furnish and install all traps, air vents, sanitary vents, as required to affect these offsets, transitions and changes in direction.
- C. Mechanical Contractor shall coordinate with other trade with regards to equipment going under mechanical equipment.



- D. Mechanical Contractor shall install HVAC and plumbing equipment in a manner to provide the manufacturer's recommended service clearance and access space. The Mechanical Contractor shall be responsible for maintaining these clearances, coordinating them with the other trades and have installed work modified to maintain these clearances at no additional charge to the project or the Owner.

3.3 PROTECTION OF WORK AND PROPERTY:

- A. Where there are existing facilities, be responsible for protection thereof, whether or not such facility is to be removed or relocated or remain as installed. Moving or removing any facility must be done so as not to cause interruption the work or Owner's Operation.
- B. All pipe and duct openings shall be closed with caps or plugs during installation. All fixtures shall be covered and protected against injury. At final completion, all work shall be cleaned and delivered in an unblemished condition, or refinished and repainted at the desecration of the Architect.

3.4 CONCEALED AND EXPOSED WORK:

- A. "Concealed" is intended to mean within such spaces as pipe chases, pipe trenches, above plaster ceilings, in walls and buried pipe is inaccessible when building is completed. "Exposed" is intended to be within equipment rooms, unfinished spaces, above "pushup" ceilings, accessible pipe tunnels, where pipe is accessible.

3.5 PROTECTION OF PENETRATION:

- A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.
- B. Contractor shall verify and coordinate locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

3.6 CONCRETE:

- A. This Contractor shall coordinate all requirements for concrete. All concrete shall be furnished under the Architectural Divisions of these specifications.

3.7 FIELD MEASUREMENTS:



- A. The Contractor shall verify the dimensions and conditions governing work at the project site. He shall examine adjoining work on which his work is dependent, for perfect efficiency, and shall report any work, which must be corrected.

3.8 LUBRICATION:

- A. The Contractor shall provide all oil and grease for the operating of all equipment until acceptance. The Contractor shall be held responsible for all damage to bearings while the equipment is being operated by him up to the date of acceptance of the equipment. The Contractor shall protect all bearings and shafts during installation and shall thoroughly grease the steel shafts to prevent corrosion.

3.9 MANUFACTURER'S DIRECTION:

- A. The Contractor shall install all equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the plans and specifications, the Contractor shall report such conflicts to the Engineer who shall make changes deemed necessary and desirable.

3.10 FLUSHING, CLEANING & STERILIZING:

- A. Before final connections are made in the piping systems, all piping shall be blown out with air and then completely washed out with cleaning compounds. The systems shall be flushed for complete removal of all foreign materials. Furnish all temporary connections, equipment, and valves required for this purpose.
- B. After flushing, sterilize the domestic water systems with an approved chlorinating agent to provide a dosage on not less than 50 ppm. After minimum contact period of twenty-four (24) hours, the system shall be flushed with clean water until the residual chlorine is no greater than the city water.
- C. Refer to specific sections for testing requirements.

3.11 TESTS:

- A. Tests shall be complete prior to final inspection and prior to covering with insulation or earth.



- B. All pressure tests shall be charted using a stripe chart recorder with enough paper for the duration of the test shown. Refer to other specifications for additional requirements. The test results shall include test run, test date, person doing the testing, and Engineer or authority having jurisdiction signature.
 - C. All tests shall be witnessed and approved by the Engineer and the local authority having jurisdiction before covering or insulating. Provide Engineer with a minimum of 24 hour written notice prior to any testing.
 - D. Test all storm drain, vent and waste lines with standing water test of 12 feet of head. Test to be held for a minimum of six (6) hours.
 - E. Hydraulically test all domestic cold, hot, and recirculating hot water and soft water service lines at 200 psig. Test to be held for a minimum of six (6) hours.
 - F. Hydraulically test fire protection per NFPA 13D.
 - G. The satisfactory operation of blowers, pumps and other equipment with moving parts shall be demonstrated to the Engineer. Equipment without movable parts shall have pressure or other tests performed by the Contractor to demonstrate satisfactory operation.
 - H. Furnish all instruments, pumps, blowers and equipment required for the testing.
 - I. Provide written approved copies of these test reports for inclusion on the Operations and Maintenance Manuals.
- 3.12 PAINTING:
- A. Surfaces of all equipment and material not provided with a factory finish coat shall be thoroughly cleaned, primed (if not factory primed) and finish coated with a high quality alkyd industrial enamel of a color chosen by the Owner.
- 3.13 SPECIAL OPENINGS:
- A. The contractor shall attempt to schedule delivery of all large equipment requiring special openings for installation prior to enclosing of area. Where this is not possible written notice of required openings which must be provided shall be listed by size and location and submitted to the General



Contractor prior to enclosing of areas involved. Work required to construct openings and the associated cost of enclosing them shall be done at no additional cost to the Owner.

3.14 PLACING IN OPERATION:

- A. All ducts, pipes, equipment, controls, hangers and supports shall be cleaned of plaster and other foreign debris.
- B. Before final acceptance, all strainers shall be thoroughly cleaned or replaced, all bearings shall be oiled or greased and all drains shall be cleaned out and primed. All permanent filters shall be cleaned; throwaway type filters shall be replaced with new filters.
- C. The systems shall be placed in operation.
- D. The contractor shall verify that all controls are set to meet operating conditions specified.
 - 1. Example: Boiler operating control set at 200° F. Limit control set at 220° F.
- E. The Contractor shall verify that all pieces of equipment are operable and that all sequences of controls are being met.
- F. Contractor to adjust seating through the first (1st) year as required by Engineer.

3.15 BALANCING, TESTING AND ADJUSTING THE MECHANICAL SYSTEMS:

- A. Balancing the mechanical systems shall be part of this contract, refer to subsequent mechanical specification section for details. This Contractor is to include in their bid the cost of balancing, testing and adjusting.

3.16 OPERATION AND MAINTENANCE INSTRUCTIONS:

- A. Contractor shall prepare and provide a minimum of four (4) copies of operating and maintenance manuals. Contractor shall deliver four bound sets to the Engineer for approval. Each manual shall be in a ring binder and shall be indexed with dividers for each section. Delivery of required documents is a condition of final acceptance.
- B. Each manual shall contain, but not limited to, the following general sections:



1. Certificates of acceptance from the inspecting authorities including approval of backflow preventer installation and certification,
2. Waiver of all liens if required by Division 1 requirements,
3. Warranties with starting dates and end dates for each pieces of equipment and/or for each system (warranties shall begin on date of substantial completion and acceptance by the Owner),
4. Names, telephone and fax numbers and addresses of all subcontractors, vendors, manufacturer's representatives, and warranties providers, (On Contractor's letterhead stationary),
5. Certification letters from each Contractor that each system furnished and installed by that contractor and/or subcontractors is started-up, balanced, adjusted and checked for proper operation in accordance with the intent of the contract documents,
6. Spare parts lists for each piece of equipment,
7. Lubrication charts showing type of lubrication and application methods and frequencies,
8. Filter cleaning or replacement schedule (On Contractor's letterhead stationary),
9. Preventative maintenance schedule for checking all items such as belt drives, safety controls, oil and refrigerant charges, and seasonal changer over recommendations. Cleaning of all strainers, traps, coils, tower pans, tubes, sprays, etc. (on Contractor's letterhead stationary),
10. Normal operating instructions including a sequence of operations (on Contractor's letterhead stationary),
11. Instructions as to procedures to be followed for emergency situations, such as alarms or safety items being tripped. (on Contractor's letterhead stationary),
12. Instruction on who to call for service during guarantee period, (on Contractor's letterhead stationary),
13. Include copies of all start-up reports on the equipment.
14. Complete AS-BUILT temperature control diagrams including written control descriptions, system sequence of operations, schematics, parts or component lists, and operating instructions shall also be provided. In addition one copy of the schematic pneumatic and/or electrical control diagrams shall be framed under glass and mounted on an equipment room wall in the vicinity of the installed equipment. Coordinate with requirements in the control [and commissioning] specifications
15. Approved copy of the Testing, Adjusting and Balancing Reports,
16. Copies of As-Built drawings on reproducible vellum as produced by a Xerox or photographic process or on CD or DVD and,
17. Copies of all **APPROVED** shop drawing submittals including nameplate date, design parameters, name, telephone and fax numbers, address of vendor, manufacturer's representative and warrantee provider.



- C. Approval will not be given for final payment until the tests, balancing, and operating instruction portions have been completed.
- D. Coordinate with commissioning specifications for additional requirements concerning operations and maintenance instructions.

3.17 INSTRUCTIONS TO THE OWNER:

- A. Contractor shall instruct the Owner's operating personnel in the operations and maintenance of all mechanical systems and equipment. There shall be a minimum of four (4) hours of training. Contractor shall furnish any special servicing tools required for maintenance.
- B. Contractor shall conduct a demonstration of the installation upon completion and final acceptance of the work. There shall be a minimum four (4) hour demonstration. Prior to this all work shall have been completed, tested, balanced and placed in operation. Qualified personnel must be present at the demonstration to operate all the systems and prove the performance of the equipment. The schedule for this demonstration shall be coordinated with the Engineer.

3.18 INSTALLATION CHECK:

- A. An experienced, competent, and authorized representative of the manufacturer or supplier of each item of equipment indicated below shall visit the site of the work and inspect, check, adjust if necessary, and approve the equipment installation. IN each case, the equipment supplier's representative shall be present when the equipment is placed in operation. The equipment supplier's representative shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation is satisfactory to the Manufacturer's Representative and Engineer.
- B. Each equipment supplier's representative shall furnish to the Engineer a written report certifying that the equipment (1) has been properly installed and lubricated; (2) is in accurate alignment; (3) is free from any undue stress imposed by connecting piping or anchor bolts; and, (4) has been operated satisfactorily.
 - 1. Equipment Requiring Installation Check:
 - a. All Pumps
 - b. Domestic Hot Water Heaters

3.19 OPERATIONAL TEST:



- A. After completion of testing, adjusting and balancing work (see related specification section) the Contractor shall perform an operating test covering all equipment furnished and installed under Division 22. This test shall cover a period of not less than 24 hours. The Contractor shall have all of his equipment operating and check all equipment for adjustments. The Contractor will instruct the Owner's operating personnel in the operation and maintenance the system following this operational test. The operational test shall be a demonstration of the operation of the systems in all specified modes. Operational test shall be conducted by the Contractor with the assistance of the Testing and Balancing Sub- Contractor. Tests as required shall be conducted in the presence of the Owner and the Mechanical Engineers. Coordinate operation testing with requirements in other specification sections.

3.20 INTERRUPTING SERVICES:

- A. The Contractor shall coordinate the installation of all work within the building in order to minimize interference with the operation of existing mechanical, plumbing, and utility systems during construction. Connections to existing systems requiring the interruption of services within the building shall be carefully coordinated with the Owner to minimize system downtimes. Requests for the interruption of existing services shall be submitted to the Owner, Architect, and/or Engineer in writing a minimum of two (2) weeks before the scheduled date. Absolutely no interruption of the existing services will be permitted without the written approval of the Owner, Architect, and/or Engineer.

3.21 CONSTRUCTION POWER:

- A. Electrical power for conducting construction activities shall be acquired as indicated by Architect and carefully coordinated with Owner's personnel.

END OF SECTION 22 05 00



SECTION 22 05 13 – BASIC MECHANICAL MATERIALS AND METHODS PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and the Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

- A. This Section includes the following basic mechanical materials and methods to complement other Division 21, 22, and 23 Sections.

1. Piping materials and installation instructions common to most piping systems.
2. Concrete equipment base construction requirements.
3. Equipment nameplate data requirements.
4. Labeling and identifying mechanical systems and equipment is specified in Division 23 Section "Mechanical Identification."
5. Nonshrink grout for equipment installations.
6. Field-fabricated metal and wood equipment supports.
7. Installation requirements common to equipment specification Sections.
8. Cutting and patching.
9. Touchup painting and finishing.

- B. Pipe and pipe fitting materials are specified in piping system Sections.

1.3 DEFINITIONS:

- A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.
- B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.



- C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
 - D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
 - E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
 - F. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- 1.4 SUBMITTALS:
- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
 - B. Product data for following piping specialties:
 - 1. Mechanical sleeve seals.
 - C. Samples of color, lettering style, and other graphic representation required for each identification material and device.
 - D. Coordination drawings for access panel and door locations.
 - E. Prepare coordination drawings according to Division 1 Section "Submittals" to a 1/4 inch equals 1 foot (1:48) scale or larger. Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Show where sequence and coordination of installations are important to the efficient flow of the Work. Include the following:
 - 1. Proposed locations of piping, ductwork, equipment, and materials. Include the following:
 - a. Planned piping layout, including valve and specialty locations and valve stem movement.
 - b. Planned duct systems layout, including elbow radii and duct accessories.
 - c. Clearances for installing and maintaining insulation.

- d. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
 - e. Equipment service connections and support details.
 - f. Exterior wall and foundation penetrations.
 - g. Fire-rated wall and floor penetrations.
2. Scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
 3. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
 4. Reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.

1.5 QUALITY ASSURANCE:

- A. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- B. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

1.6 DELIVERY, STORAGE AND HANDLING: A. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Protect stored plastic pipes from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING:



- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.
- E. Coordinate connection of electrical services.
- F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in this Section.
- H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

PART 2 – PRODUCTS

2.1 PIPE AND PIPE FITTINGS:

- A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS:

- A. Refer to individual piping system specification Sections in Division 22 for special joining materials not listed below.



- B. Plastic Pipe Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, except where other type or material is indicated.

2.3 PIPING SPECIALTIES:

- A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type where required to conceal protruding fittings and sleeves.
 - 1. Inside Diameter: Closely fit around pipe, tube, and insulation.
 - 2. Outside Diameter: Completely cover opening.
 - 3. Cast Brass: One-piece, with setscrew. a. Finish: Rough brass.
 - b. Finish: Polished chrome plate.
- B. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.
 - 1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.
 - 2. Insulating Material: Suitable for system fluid, pressure, and temperature.
 - 3. Dielectric Unions: Factory-fabricated, union assembly for 250-psig minimum working pressure at a 180° F temperature.
 - 4. Dielectric Flanges: Factory-fabricated, companion-flange assembly for 150- or 300- psig minimum pressure to suit system pressures.
 - 5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full- face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - a. Provide separate companion flanges and steel bolts and nuts for 150- or 300- psig minimum working pressure to suit system pressures.
 - 6. Dielectric Couplings: Galvanized-steel coupling, having inert and noncorrosive, thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225° F temperature.
 - 7. Dielectric Nipples: Electroplated steel nipple, having inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and



300-psig working pressure at 225^o F temperature.

2.4 GROUT:

A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.

1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi 28-day compressive strength.
3. Packaging: Premixed and factory-packaged.

2.5 ACCESS DOORS: A. Flush mounted steel access doors with 16 ga. frame and 14 ga. Panel. Prime coat finish.

Concealed spring hinges, screwdriver cam-lock. Doors in fire rated surfaces shall be U.L. listed and labeled. Doors to be Milcor or approved equivalent.

PART 3 – EXECUTION

3.1 PIPING SYSTEMS--COMMON REQUIREMENTS:

- A. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 21, 22 and 23 specify piping installation requirements unique to the piping system.
- B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.
- C. Coordinate the thickness of the wall to accommodate the concealed piping and its associated insulation, if required. I.E., 4 inch sewer or vent line required a 6 inch thick wall.
- D. Install piping at indicated slope.
- E. All pipes, ducts, and conduit shall be hung as high as possible. Electrical work shall be hung above other work.



- F. Exact location of electric outlets, piping, ducts, and the like shall be coordinated to avoid interferences between lighting fixtures, piping, ducts, structural elements, and similar items.
- G. Install components having pressure rating equal to or greater than system operating pressure.
- H. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- I. Install piping free of sags and bends.
- J. Install exposed interior and exterior piping at right angles or parallel to building walls.
Diagonal runs are prohibited, except where indicated.
- K. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- L. Install piping to allow application of insulation plus 1-inch clearance around insulation. M. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- N. Install fittings for changes in direction and branch connections. O. Install couplings according to manufacturer's printed instructions.
- P. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
 - 1. Chrome-Plated Piping: Cast-brass, one-piece, with setscrew, and polished chrome-plated finish.
- Q. Protection of Penetrations
 - 1. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.
 - 2. Contractor shall verify locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

- R. Verify final equipment locations for roughing in.
- S. Refer to equipment specifications in other Sections for roughing-in requirements.
- T. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system Sections.
1. Ream ends of pipes and tubes and remove burrs.
 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 3. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter. Join pipe fittings and valves as follows:
 - a. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).
 - c. Align threads at point of assembly.
 - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - e. Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
 4. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
 5. No union shall be placed in a location which will be inaccessible after completion of the project.
 6. A union or flange shall be installed so equipment may be readily disconnected:
 - a. On each side of each control valve, regulator, and similar items.
 - b. On one side of each check valve and each trap.
 - c. At all connections to pieces of equipment such as chillers, boilers, pumps, compressors, tanks, and similar items
- U. Piping Connections: Except as otherwise indicated, make piping connections as specified below.
1. Install unions in piping 2 inches and smaller adjacent to each valve and at final connection to each piece of equipment having a 2-inch or smaller threaded pipe connection.



2. Dry Piping Systems (Gas): Install dielectric unions and flanges to connect piping materials of dissimilar metals.
3. Wet Piping Systems (Water): Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

V. Access To Valves

1. Valves, bearings, and other operating parts located in equipment rooms, installed more than 6'-6" to center line above the floor or platform or are not readily accessible due to the proximity of the other equipment shall be provided with chain wheels, extension stems, extension oil pipes, and similar devices. The above provision does not apply to finished spaces.

3.2 EQUIPMENT INSTALLATION--COMMON REQUIREMENTS:

- A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Architect.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.
- D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
- E. Install equipment, giving right-of-way to piping systems installed at a required slope.
- F. Provide means for making adjustments to mechanical equipment without bending, springing, or otherwise deforming any part (items such as belt drives, damper linkages, and pulleys). Adjustments shall incorporate set-screws or similar means for positive settings.

3.3 ACCESS DOORS:

- A. Furnish an access door for each pipe chase for each floor. This includes both toilet plumbing chases and pipe riser chases. Access doors assembly to be size 16" x 16".



- B. Also, furnish access doors in all non-removable ceiling and in partitions and walls where necessary access to plumbing cleanouts trap primers, or air gap fittings, shock absorbers, fire dampers, manual dampers, valves and other mechanical devices requiring access. Size these as required for access with minimum size of 12" x 12".
 - C. Any access doors furnished for installation in fire rated surfaces or assembly shall carry an approved fire rating for that use.
 - D. Any access doors furnished for installation in glued on acoustical surfaces or assembly shall have recessed door to allow installation of tiles.
 - E. Provide all access doors to the General Contractor for them to construct into the building.
- 3.4 PAINTING AND FINISHING:
- A. Refer to Division 09 00 00 Section "Painting" for field painting requirements.
 - B. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
- 3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE:
- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
 - B. Field Welding: Comply with AWS D1.1 "Structural Welding Code--Steel."
- 3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGE:
- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.
 - B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.



- C. Attach to substrates as required to support applied loads.

3.7 DEMOLITION:

- A. Disconnect, demolish, and remove work specified under Division 21, 22 and 23 or as indicated.
 - B. Where pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
 - C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety. D. Removal: Remove indicated equipment from the Project site.
 - E. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.
- 3.8 CUTTING AND PATCHING:

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of the trades involved.
- B. Repair cut surfaces to match adjacent surfaces. END OF SECTION 22 05 13



SECTION 22 11 16 - DOMESTIC WATER PIPING

(Hot and Cold Water Potable Water Distribution)

PART 1 GENERAL

1.01 Summary

Specifier note: The work covered by this section includes materials required to supply, install and pressure test cross-linked polyethylene (PEX) tubing manufactured by Uponor, Inc. as shown on drawings or as specified. This specification is for Wirsbo AQUAPEX or Wirsbo AQUAPEX plus tubing used with ProPEX fittings. For the purpose of this specification, Uponor, Inc. is hereby referred to as the PEX tubing manufacturer.

- A. Section includes: Potable hot and cold water distribution system, using crosslinked polyethylene (PEX) tubing and ASTM F1960 cold expansion fittings.

Specifier note: omit the following article when specifying manufacturer's proprietary products and recommended installation. Retain References Article when specifying products and installation by an industry-reference standard. If retained, list standard(s) referenced in this section. Indicate issuing authority name, acronym, standard designation and title. Establish policy for indicating edition date of standard referenced. Conditions of the Contract or Division 1 References Section may establish the edition date of standards. This article does not require compliance with standard. It is a listing of all references used in this section.

1.02 References

- A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- B. ASTM International
 1. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
 2. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials
 3. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops
 4. ASTM F876 Standard Specification for Cross-linked Polyethylene (PEX) Tubing



5. ASTM F877 Standard Specification for Cross-linked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems
 6. ASTM F1960 Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing
- C. American National Standards Institute (ANSI)/National Sanitation Foundation (NSF)
1. ANSI/NSF Standard 14 Plastics Piping System Components and Related Materials
 2. ANSI/NSF Standard 61 Drinking Water System Components - Health Effects
- D. American National Standards Institute (ANSI)/Underwriters Laboratories, Inc. (UL)
1. ANSI/UL 263 Standard for Safety for Fire Tests of Building Construction and Materials
- E. Canadian Standards Association (CSA)
1. CAN/CSA B137.5: Cross-linked Polyethylene (PEX) Tubing Systems for Pressure applications
- F. International Code Council (ICC)
1. International Plumbing Code (IPC)
 2. ICC Evaluation Service (ES) Evaluation Report No. ESR 1099
- G. Building Officials and Code Administrators International (BOCA)
1. 1993 BOCA National Plumbing Code
- H. International Association of Plumbing Officials (IAPMO)
1. Uniform Plumbing Code (UPC)
- I. National Association of Plumbing, Heating and Cooling Contractors (NAPHCC)
1. National Standard Plumbing Code (NSPC)
- J. U.S. Department of Housing and Urban Development (HUD)
1. HUD Material Release No. 1269
- K. Plastics Pipe Institute (PPI)
1. PPI Technical Report TR-4/06
- L. Uponor, Inc.

1. Uponor Professional Plumbing Installation Guide, 2006

Specifier note: In the following article, restrict to statements describing design or performance requirements and functional (not dimensional) tolerances of a complete system. Limit descriptions to composite and operational properties required to link components of a system together and to interface with other systems.

1.03 System Description

A. Design Requirements

1. Standard grade hydrostatic pressure ratings from Plastics Pipe Institute (PPI) in accordance with TR-3 as listed in TR-4. The following three standard-grade hydrostatic ratings are required.
 - a. 200°F (93°C) at 80 psi (551 kPa)
 - b. 180°F (82°C) at 100 psi (689 kPa)
 - c. 73.4°F (23°C) at 160 psi (1,102 kPa)
2. Certification of flame spread/smoke development rating of 25/50 in accordance with ASTM E84 provided the installation meets one of the following requirements.
 - a. Tubing spacing is a minimum of 18 inches apart for the following sizes.
 1. $\frac{3}{8}$ inch [9.53mm]
 2. $\frac{1}{2}$ inch [12.7mm]
 3. $\frac{5}{8}$ inch [15.88mm]
 4. $\frac{3}{4}$ inch [19.05mm]
 - b. Tubing is wrapped with $\frac{1}{2}$ " fiberglass insulation with a flame spread of not more than 20 and a smoke-developed rating of not more than 30 and a nominal density of 4.0 to 4.5 pcf. Tubing can run with three tubes separated by zero inches and then 18 inches between the next group of three tubes for the following sizes.
 1. $\frac{3}{8}$ inch [9.53mm]
 2. $\frac{1}{2}$ inch [12.7mm]
 3. $\frac{5}{8}$ inch [15.88mm]



4. ¾ inch [19.05mm]
 5. 1 inch [25.4mm]
 6. 1¼ inch [31.75mm]
 7. 1½ inch [38.1mm]
 8. 2 inch [50.8mm]
- B. Performance Requirements: To provide a PEX tubing hot and cold potable water distribution system, which is manufactured, fabricated and installed to comply with regulatory agencies and to maintain performance criteria stated by the PEX tubing manufacturer without defects, damage or failure.
1. Comply with ANSI/NSF Standard 14.
 2. Comply with ANSI/NSF Standard 61.
 3. Show compliance with ASTM F877.
 4. Show compliance with ASTM E119 and ANSI/UL 263 through certification listings with Underwriters Laboratories, Inc. (UL).
 - a. UL Design No. L557 — 1 hour wood frame floor/ceiling assemblies
 - b. UL Design No. K913 — 2 hour concrete floor/ceiling assemblies
 - c. UL Design No. U372 — 1 hour wood stud/gypsum wallboard wall assemblies
 - d. UL Design No. V444 — 1 hour steel stud/gypsum wallboard wall assemblies

Specifier note: The following article includes submittal of relevant data to be furnished by Contractor before, during or after construction. Coordinate this article with Architect's and Contractor's duties and responsibilities in Conditions of the Contract and Division 1 Submittal Procedures Section.

1.04 Submittals

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
- B. Product Data: Submit manufacturer's product submittal data and installation instructions.



- C. Shop Drawings: Provide installation drawings indicating tubing layout, manifold locations, plumbing fixtures supported and schedules with details required for installation of the system.
- D. Samples: Submit selection and verification samples of tubing.
- E. Quality Assurance/Control Submittals: Submit the following:
 - 1. Test Reports: Upon request, submit test reports from recognized testing laboratories.
 - 2. Certificates: Submit the following:
 - a. Manufacturer's certificate that products comply with specified requirements.
 - b. Certificate indicating that the installer is authorized to install the manufacturer's products
- F. Closeout Submittals: Submit the following:
 - 1. Warranty documents specified herein
 - 2. Operation and maintenance data

Specifier note: The following article should include statements of prerequisites, standards, limitations and criteria that establish an overall level of quality for products and workmanship for this section. Coordinate the following article with Division 1 Quality Assurance Section.

1.05 Quality Assurance

- A. Installer Qualifications: Use an installer with demonstrated experience on projects of similar size and complexity and possessing documentation proving successful completion of PEX plumbing installation training by the PEX tubing manufacturer.

Specifier note: The following paragraph should list obligations for compliance with specific code requirements particular to this section. General statements to comply with a particular code are typically addressed in Conditions of the Contract and Division 1 Regulatory Requirements Section. Avoid repetitive statements.



- B. Regulatory Requirements and Approvals: Provide domestic potable system that complies with requirements of the following:
1. International Code Conference (ICC) – International Plumbing Code (IPC)
 - a. ICC Evaluation Service (ES) Evaluation Report No. ESR 1099
 2. Building Officials and Code Administrators International (BOCA)
 - a. 1993 BOCA National Plumbing Code
 3. Uniform Plumbing Code (UPC)
 - a. IAPMO Files 3558, 3946 and 3960
 4. National Standard Plumbing Code (NSPC)
 5. HUD Material Release No. 1269
- C. Certifications: Provide letters of certification as follows:
1. Installer is trained by the PEX tubing manufacturer to install the PEX potable water distribution system.
 2. Installer will use skilled workers holding a trade qualification license or equivalent, or apprentices under the supervision of a licensed trades professional.

Specifier note: Retain the paragraph if pre-installation meeting is required.

- D. Pre-installation Meetings: [Specify requirements for meeting.] Verify project timeline requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

Specifier note: The following article should include specific protection and environmental conditions required during storage. Coordinate article below with Division 1 Product Requirements Section.

1.06 Delivery, Storage and Handling

- A. General: Comply with Division 1 Product Requirement Section.



- B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
 - 1. Store PEX tubing in cartons or under cover to avoid dirt or foreign material from being introduced into the tubing.
 - 2. Do not expose PEX tubing to direct sunlight for more than 30 days. If construction delays are encountered, provide cover to portions of tubing exposed to direct sunlight.

Specifier note: Coordinate the following article with Conditions of the Contract and with Division 1 Closeout Submittals (Warranty) Section. Use this article to require special or extended warranty or bond covering the work of this section.

1.07 Warranty

- A. Uponor offers a limited warranty of up to 25 years for its Wirsbo AQUAPEX® tubing and Wirsbo hePEX™ tubing and ProPEX® Fittings when installed by an Uponor-trained contractor and certified plumbing professional. See www.uponor-usa.com for details in the Customer Service section.

Part 2 Products

Specifier note: Retain the following article for proprietary method specification. Add product attributes, performance characteristics, material standards and descriptions as applicable. Use of such phrases as "or equal" or "or approved equal" or similar phrases may cause ambiguity in specifications. Such phrases require



verification (procedural, legal and regulatory) and assignment of responsibility for determining "or equal" products.

2.01 Hot and Cold Potable Water Distribution System

Specifier note: The following paragraph is an addition to CSI *SectionFormat*. Retain, edit or delete the following paragraph to suit project requirements and specifier practice.

A. Manufacturer: Uponor

1. Contact: 5925 148th Street West, Apple Valley, MN 55124; Toll free (800) 321-4739, (952) 891-2000; Fax: (952) 891-2008; website: www.uponor-usa.com

Specifier note: Edit the following article to suit project requirements. If substitutions are permitted, edit the following text. Add text to refer to Division 1 Project Requirements (Product Substitutions Procedures) Section.

2.02 Product Substitutions

A. Substitutions: No substitutions permitted.

Specifier note: Specify materials to be furnished. This article may be omitted and the materials can be included with the description of a manufactured unit, equipment, component or accessory.

2.03 Materials

A. Tubing

1. Material: Crosslinked polyethylene (PEX) manufactured by PEX-a or Engel method
2. Type: Wirsbo AQUAPEX
3. Material Standard: Manufactured in accordance with ASTM F876 and ASTM F877 and tested for compliance by an independent third party agency

4. Standard grade hydrostatic design and pressure ratings from PPI
5. Fire-rated assembly listings in accordance with ANSI/UL 263
 - a. UL Design No. L557 — 1-hour wood frame floor/ceiling assemblies
 - b. UL Design No. K913 — 2-hour concrete floor/ceiling assemblies
 - c. UL Design No. U372 — 1-hour wood stud/gypsum wallboard wall assemblies
 - d. UL Design No. V444 — 1-hour steel stud/gypsum wallboard wall assemblies
6. Minimum Bend Radius (cold bending): No less than six times the outside diameter. Use a bend support as supplied by the PEX tubing manufacturer for tubing with a bend radius less than stated.
7. Nominal Inside Diameter: Provide tubing with nominal inside diameter, in accordance with ASTM F876 as indicated.
 - a. $\frac{3}{8}$ inch [9.53mm]
 - b. $\frac{1}{2}$ inch [12.7mm]
 - c. $\frac{3}{4}$ inch [19.05mm]
 - d. 1 inch [25.4mm]
 - e. $1\frac{1}{4}$ inch [31.75mm]
 - f. $1\frac{1}{2}$ inch [38.1mm]
 - g. 2 inch [50.8mm]

B. Fittings

1. Material: Fitting assembly is manufactured from material listed in paragraph 5.1 of ASTM F1960.
2. Material Standard: Comply with ASTM F1960.
3. Type: PEX-a cold expansion fitting.
 - a. Assembly consists of the appropriate ProPEX insert with a corresponding ProPEX Ring.

C. Manifolds

1. Material

- a. Type L copper body with UNS 3600 series brass ProPEX outlet connections

- b. Engineered Plastic (EP) body with ProPEX outlet connections
2. Manifold Type
 - a. Uponor ProPEX 1" Copper Manifold
 - b. Uponor engineered plastic (EP) Manifold
3. All manifolds manufactured with the appropriate-sized ProPEX fittings on the manifold supply inlets.
- D. Accessories
 1. Angle stops and straight stops that are compatible with PEX tubing are supplied by the PEX tubing manufacturer.
 2. Bend supports designed for maintaining tight radius bends are supplied by the PEX tubing manufacturer.
 3. ProPEX expander tool to install the ASTM F1960 compatible fittings are supplied by the PEX tubing manufacturer.
 4. The tubing manufacturer provides clips and/or PEX rails for supporting tubing runs.
 5. All horizontal tubing hangers and riser clamps are epoxy-coated material.

Part 3 Execution

Specifier note: The following article is an addition to the CSI *SectionFormat*. Revise the following article to suit project requirements and specifier's practice.

3.01 Manufacturer's Instructions

- A. Comply with manufacturer's product data, including product technical bulletins, installation instructions, design drawings and the Uponor Professional Plumbing Installation Guide.

Specifier note: Specify actions to physically determine that conditions are acceptable to receive primary products of the section.

3.02 Examination



A. Site Verification of Conditions:

1. Verify that site conditions are acceptable for installation of the PEX potable water system.
2. Do not proceed with installation of the PEX potable water system until unacceptable conditions are corrected.

Specifier note: Coordinate the following article with manufacturer's recommended installation requirements.

3.03 Installation

A. Wirsbo AQUAPEX Tubing

1. Install Wirsbo AQUAPEX tubing in accordance with the tubing manufacturer's recommendations and as indicated in the installation handbook.
2. Do not install PEX tubing within 6 inches [152 mm] of gas appliance vents or within 12 inches [305 mm] of any recessed light fixtures.
3. Do not solder within 18 inches [457 mm] of PEX tubing in the same waterline. Make sweat connections prior to making PEX connections.
4. Do not expose PEX tubing to direct sunlight for more than 30 days.
5. Ensure no glues, solvents, sealants or chemicals come in contact with the tubing without prior permission from the tubing manufacturer.
6. Use grommets or sleeves at the penetration for PEX tubing passing through metal studs.
7. Protect PEX tubing with sleeves where abrasion may occur.
8. Use strike protectors where PEX tubing penetrates a stud or joist and has the potential for being struck with a screw or nail.
9. Use tubing manufacturer-supplied bend supports where bends are less than six times the outside tubing diameter.
10. Minimum horizontal supports are installed not less than 32 inches between hangers in accordance with model plumbing codes and the installation handbook.
11. PEX riser installations require epoxy-coated riser clamps installed at the base of the ceiling per floor.

12. A mid-story support is required for riser applications.
 13. Pressurize Wirsbo AQUAPEX tubing with air in accordance with applicable codes or in the absence of applicable codes to a pressure of 25 psi (173 kPa) above normal working pressure of the system.
 14. Comply with safety precautions when pressure testing, including use of compressed air, where applicable. Do not use water to pressurize the system if ambient air temperature has the possibility of dropping below 32°F (0°C).
- B. Through-penetration Firestop
1. Ensure compliance of one- and two-hour rated through penetration assemblies in accordance with ASTM E814.
 2. A list of firestop manufacturers that list PEX tubing with their firestop systems is available from the PEX tubing manufacturer.
- C. Related Products Installation: Refer to other sections listed in Related Sections paragraph herein for related products installation.

Specifier note: Specify the tests and inspections required for installed or completed work.

3.04 Field Quality Control

- A. Site Tests
1. [Specify applicable test requirements to be performed during and after product installation.]
- B. Manufacturer's Field Services: Provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.
1. Site Visits: [Specify number and duration of periodic site visits.]

Specifier note: Specify the final actions required to clean installed equipment or other completed work to properly function or perform. Coordinate article below with Division 1 Execution Requirements (Cleaning) Section.



3.05 Cleaning

- A. Remove temporary coverings and protection of adjacent work areas.
- B. Repair or replace damaged installed products.
- C. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.
- D. Remove construction debris from project site and legally dispose of debris.

Specifier note: Specify provisions for protecting work after installation but prior to acceptance by the owner. Coordinate the following article with Division 1 Execution Requirements Section.

3.06 Protection

- A. Protect installed work from damage due to subsequent construction activity on the site.

End of Section



SECTION 22 11 16 – PLUMBING PIPING PART 1 – GENERAL

1.1 SECTION INCLUDES: A. Pipe and pipe

fittings. B. Valves.

C. Sanitary sewer piping system. D.

Domestic water piping system.

1.2 RELATED SECTIONS:

A. Section 33 13 00 – Disinfection of Water Distribution System. B. Section

23 05 53 – Mechanical Identification.

C. Section 22 07 19 – Piping Insulation.

D. Section 22 11 19 – Plumbing Specialties. E. Section 22

30 00 – Plumbing Equipment. F. Section 22 36 00 – Solar

System.

G. Section 22 40 00 – Plumbing Fixtures.

1.3 REFERENCES:

A. ANSI B31.9 – Building Service Piping.

B. ASME – Boiler and Pressure Vessel Code.

C. ASTM D2241 – Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).

D. ASTM D2466 – Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

E. ASTM D2564 – Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings. F. ASTM D2683

– Socket-Type Polyethylene Fittings for Outside Diameter-Controlled

Polyethylene Pipe.



- G. ASTM D2846 – Chlorinated Polyvinyl Chloride (CPVC) Pipe, Fittings, Solvent Cements and Adhesives for Potable Hot Water Systems.
 - H. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
 - M. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
 - N. NAIMA National Insulation Standards.
 - O. NFPA 255 – Standard Method of Test of Surface Burning Characteristics of Building Materials.
 - P. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.
- 1.4 SUBMITTALS FOR REVIEW:
- A. Section 01 33 00 – Submittals: Procedures for submittals and Section 23 00 00 – General Mechanical Requirements.
 - B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- 1.5 SUBMITTALS FOR INFORMATION:
- A. Section 01 33 00 – Submittals: Procedures for submittals and Section 22 05 00 – General Mechanical Requirements.
 - B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.
- 1.6 QUALITY ASSURANCE:
- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
 - B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.
- 1.7 REGULATORY REQUIREMENTS:



- A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255, and UL 723.

1.8 DELIVERY, STORAGE, AND PROTECTION:

- A. Section 01 60 00 – Material and Equipment: Transport, handle, store, and protect products.
- B. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.9 ENVIRONMENTAL REQUIREMENTS:

- A. Section 23 05 00 – Material and Equipment: Environmental conditions affecting products on site. B. Maintain ambient conditions required by manufacturers of each product.

C. Maintain temperature before, during, and after installation for minimum of 24 hours. PART 2 – PRODUCTS

2.1 MANUFACTURER: A. Johns Manville.

- B. Owens Corning. C. Knauf.
- D. ARMAFLEX

- E. Substitutions: Refer to Section 23 05 00 – Material and Equipment and Section 22 05 00 – General Mechanical Requirements.

2.2 GLASS FIBER:

- A. Insulation: ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.

1. 'K' value: ASTM C177, 0.24 at 75^o F.
2. Maximum service temperature: 650^o F.
3. Maximum moisture absorption: 0.2 percent by volume.

- B. Vapor Barrier Jacket:



1. ASTM C921, White Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers. D. Vapor Barrier Lap Adhesive:

1. Compatible with insulation. E.

Insulating Cement/Mastic:

1. ASTM C195; hydraulic setting on mineral wool. F. Fibrous

Glass Fabric:

1. Cloth: Untreated: 9 oz/sq. yd weight.
2. Blanket: 1.0 lb/cu ft density.
3. Weave: 10x10.

G. Indoor Vapor Barrier Finish:

1. Cloth: Untreated: 9 oz/sq. yd weight.
2. Vinyl emulsion type acrylic, compatible with insulation, white color. H.

Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color. I. Outdoor

Breather Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color. J. Insulating

Cement:

1. ASTM C449/C449M.

2.3 CELLULAR FOAM:

A. Insulation: ASTM C534; flexible, cellular elastomeric, molded or sheet.

1. 'K' value: ASTM C177: 0.27 at 75^o F.
2. Minimum service temperature: -40^o F.
3. Maximum service temperature: 220^o F.
4. Maximum moisture absorption: ASTM D1056; 3.5 percent (pipe) by volume, 6.0 percent (sheet) by volume.
5. Moisture vapor transmission: ASTM E96; 0.17 perm-inches.



6. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive:

1. Air dried, contact adhesive, compatible with insulation.

2.4 JACKETS: A. ABS Plastic:

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum service temperature: -40° F.
 - b. Maximum service temperature of 180° F.
 - c. Moisture vapor transmission: ASTM E96; 0.012 perm-inches.
 - d. Thickness: 30 mil.
 - e. Connections: Brush on welding adhesive.

PART 3 – EXECUTION

3.1 EXAMINATION:

- A. Section 01 31 00 – Coordination and Meetings: Verification of existing conditions before starting work.
- B. Verify that piping has been tested before applying insulation materials.
- C. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION:

- A. Section 01 45 00 – Quality Control: Manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, [pump bodies,] and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140^o F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140^o F, insulate flanges and unions at equipment. H. Glass fiber insulated pipes conveying fluids above ambient temperature:
1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 27 00.
- J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): ABS jacket and fitting covers.
- K. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement and ABS jacket and fitting covers.
- 3.3 PROTECTION OF PENETRATION:
- A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code. B. Contractor shall verify locations and type of all partitions penetrations from the drawings.
- Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.



3.4 SCHEDULES:

A. Plumbing Systems:

1. Domestic Cold, Hot, and recirculation Water Supply:

a. Glass Fiber Insulation:

- 1). Pipe Size Range: ALL.
- 2). Thickness: 1.0 inch.

B. Heating Systems:

1. Heating Water Supply and Return:

a. Glass Fiber Insulation:

- 1). Pipe Size Range: ALL.
- 2). Thickness: 2 inch.

C. Cooling Systems:

1. Chilled Water Supply and Return:

a. Glass Fiber Insulation:

- 1). Pipe Size Range: ALL.
- 2). Thickness: 2 inch.

END OF SECTION 23 07 19



SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SECTION REQUIREMENTS

A. Submittals: Product Data.

PART 2 - PRODUCTS

2.01 BACKFLOW PREVENTER

A. Watts

1. Bronze construction. Temperature Range: 33 °F – 180 °F. Max pressure: 150 psi.

2. Part #: 7U2-2

3. <http://media.wattswater.com/ES-7.pdf>

2.02 THERMOSTATIC MIXING VALVE

A. Caleffi

1. Manually adjustable, bronze body. Includes integral temperature guage.

Maximum pressure: 200 psi, Maximum temperature: 200 °F

2. Part #: 521519A

3. http://www.caleffi.us/en_US/Technical_brochures/01050/01050.pdf

2.03 BALL VALVES

A. Viega

1. 3/4" Ball Valve with full-port, Propress end connectors, and pressure rating of 200 PSI.

2. Part #: 22058

3. www.viega.net/cps/rde/xbcr/fr-us/TDPPBrzBVMetal0309.pdf



2.04 PEX MANIFOLDS

A. Uponor

1. Cold Water Manifold: Copper construction with one 1" inlet and eight ½" outlets.
2. Part #: Q2500800

B. Uponor

1. Hot Water Manifold: Copper construction with one 1" inlet and six ½" outlets.
2. Part #: Q2500600

2.05 PRESSURE REDUCING VALVE

A. Wilkins

1. Max. working water pressure: 400 psi, Reduced pressure range: 25 – 75 PSI,

FNPT connectors ANSI B1.20.1

2. Part #: NR3

3. www.airdelights.com/specifications/wilkins/NR3_spec_sheet.pdf

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install backflow preventers at each water-supply connection to mechanical equipment and where required by authorities having jurisdiction.

B. Install hose bibs with integral or field-installed vacuum breaker.

END OF SECTION



SECTION 22 30 00 – PLUMBING EQUIPMENT PART 1 – GENERAL

- 1.1 SECTION INCLUDES: A. Water Heaters.
B. Pumps.

1. Circulators.

- C. Water pressure booster system.

1.2 RELATED SECTIONS:

- A. Section 26 05 03 – Equipment Wiring Systems: Electrical characteristics and wiring connections.

1.3 REFERENCES:

- A. ASHRAE 90A – Energy Conservation in New Building Design. B. ASME
Section 8D – Pressure Vessels.
C. NFPA 70 – National Electrical Code.

- D. UL 1453 – Electric Booster and Commercial Storage Tank Water Heaters. E. UL 174 –
Household Electric Storage Tank Water Heaters.

1.4 SUBMITTALS FOR REVIEW:

- A. Section 01 33 00 – Submittals: Procedures for submittals and Section 22 05 00 – General
Mechanical Requirements.

- B. Product Data:

1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
2. Indicate pump type, capacity, and power requirements.
3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
4. Provide electrical characteristics and connection requirements.



C. Shop Drawings:

1. Indicate heat exchanger dimensions, size of tappings, and performance data.
2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains. I. ASTM F876 – Crosslinked Polyethylene (PEX) Tubing.

J. ASTM F877 – Crosslinked Polyethylene (PEX) Plastic Hot - and Cold - Water Distribution Systems.

K. ASTM F493 - Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

L. AWWA C651 - Disinfecting Water Mains.

1.4 SUBMITTALS:

A. Submit under provisions of Section 01 33 00 and 22 05 00.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.5 PROJECT RECORD DOCUMENTS:

A. Submit under provisions of Sections 01 78 39 and 22 05 00. B. Record actual locations of valves.

1.6 OPERATION AND MAINTENANCE DATA:

A. Submit under provisions of Sections 01 78 23 and 22 05 00.

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.7 QUALITY ASSURANCE:

A. Valves: Manufacturer's name and pressure rating marked on valve body.



1.8 QUALIFICATIONS:

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing the work of this section with minimum three years documented experience and approved by the manufacturer.

1.9 REGULATORY REQUIREMENTS:

- A. Perform Work in accordance with State of Texas and city of El Paso plumbing code.

1.10 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver, store, protect, and handle products to site under provisions of Sections 01 60 00 and 22 05 00.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage. C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.11 ENVIRONMENTAL REQUIREMENTS:

- A. Do not install underground piping when bedding is wet or frozen.

1.12 EXTRA MATERIALS:

- A. Furnish under provisions of Sections 01 78 46 and 22 05 00. B. Provide two repacking kits for each size valve.

PART 2 – PRODUCTS



2.1 SANITARY SEWER PIPING, ABOVE GRADE: A. PVC Pipe: ASTM

D-1785.

1. Fittings: PVC.
2. Joints: ASTM D22665, hub and spigot solvent weld with ASTM D2564 solvent cement.

2.2 WATER PIPING, ABOVE GRADE: A. PEX Tubing:

1. Zurn PEX Performa tubing is produced using the silane method of cross-linking. For the following fitting systems: ASTM F1807, ASTM F1865, ASTM F1960, ASTM F2080, or ASTM F2098. Listings NSF 14 (NSF -rfh marking), PMG 1039, ASTM F876 for performance

2.3 BALL VALVES: A. Manufacturers:

1. NIBCO.
2. Milwaukee.
3. Grinnell Corp.
4. Refer to Sections 01 60 00 – Materials and Equipment and 22 05 00 – General

Mechanical Requirements: For Product options and substitutions. B. Up to and including 2 Inches: Bronze two piece body, stainless full ported steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, solder or threaded ends with union.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. The drawings indicate the locations, type and sizes of various utilities within the site where known. These utilities are indicated as accurately as possible. If the Contractor encounters any utilities or differing conditions during construction, which are not shown on the drawings, they shall request in writing for written instructions from the Architect and/or Engineer
- B. Contractor shall verify location, size, elevation, pressure and any other pertinent data of the existing utilities. The Contractor shall provide a written report with drawings indicating this existing utilities information, such as utility locations and sewer invert information.

3.2 PREPARATION:

- A. Ream pipe and tube ends. Remove burrs.



- B. Remove scale and dirt, on inside and outside, before assembly. C.

Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION:

- A. Install in accordance with manufacturer's instructions.

- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals. C. Route piping in orderly manner and maintain gradient.

- D. Install piping to conserve building space and not interfere with use of space. E. Group piping whenever practical at common elevations.

- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

- G. Provide clearance for installation of insulation and access to valves and fittings.

- H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

- I. Provide support for utility meters in accordance with requirements of utility companies.

- J. Prepare, clean, and prime pipe, fittings, supports, and accessories not prefinished and ready for finish painting. Refer to Section 09 90 00.

- K. Install bell and spigot pipe with bell end upstream.

- L. Install valves with stems upright or horizontal, not inverted.

3.4 APPLICATION:

- A. Use grooved mechanical couplings and fasteners only in accessible locations.

- B. Install unions downstream of valves and at equipment or apparatus connections.



- C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers. D. Install ball valves for throttling, bypass, or manual flow control services.

3.5 ERECTION TOLERANCES:

- A. Establish invert elevations, slopes for drainage to 1/4 or 1/8 inch per foot per code requirement. Maintain gradients.
- B. Slope water piping and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM: A. Refer to Section 22 05

00 for additional information.

- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.
- J. Provide copy of sample report to the engineer. Include a copy of the sample report in each of the Owner's Manuals; refer to Section 22 05 00.

END OF SECTION 22 11 16



SECTION 22 33 30 – RESIDENTIAL ELECTRIC DOMESTIC WATER HEATER

PART 1 - GENERAL

1.01 SECTION REQUIREMENTS

- A. Submittals: Product Data
- B. Comply with NFPA 70, "National Electrical Code."
- C. Warranty: 6-year limited tank and parts warranty.

PART 2 - PRODUCTS

2.01 80 GALLON HOT WATER HEATER

A. A.O. Smith

- 1. Foam Insulation – R-Value of 16, Glass-Lined Tank, Dielectric Nipples
- 2. Heating Element –4500 watt immersion type heating element for heating system back-up.
- 3. Part #: SUNX-80
- 4. http://s3.pexsupply.com/manuals/1277918330238/33850_PROD_FILE.pdf

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Set units level, plumb, and true to line, without warp or rack of frames and panels and anchor securely in place.
- B. Fasten securely in place, with provisions for thermal and structural movement. Install with concealed fasteners, unless otherwise indicated.
- C. Separate dissimilar metals and metal products from contact with wood or cementations materials, by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.
- D. Correct deficiencies in or remove and reinstall products that do not comply with



requirements.

E. Repair, refinish, or replace products damaged during installation, as directed by

Architect.

F. Adjust operating parts and hardware for smooth, quiet operation.

END OF SECTION



SECTION 22 36 00 – SOLAR DOMESTIC HOT WATER SYSTEM PART 1 – GENERAL

1.1 SUMMARY:

- A. Section includes solar collectors, controls, pipe and fittings, valves, tanks, pumps, control system, electric water heater tank, cleaning and chemical treatment of systems.

1.2 RELATED SECTIONS:

- A. Sheet SP-5.0 – Wiring Connections: Execution requirements for electric connections specified by this section.

1.3 REFERENCES:

- A. ASME Section VIII-D (ANSI/American Society of Mechanical Engineers) – Boiler and Pressure Vessel Code.

- B. ASTM B32 - Solder Metal.

- C. ASTM B75 - Seamless Copper Tube. D. ASTM

- B42 - Seamless Copper Pipe.

1.4 SUBMITTALS:

- A. Shop Drawings: Indicate manufactured assembly's system and control schematics, solar collector installation, layout, weights, mounting and support details, and piping materials and connections.
- B. Product Data: Submit data on specialties, including manufacturers catalog information. Indicate chemical treatment materials, chemicals, and equipment. Submit certified pump performance and NPSH curve. Submit performance ratings and rough-in details for solar collectors.
- C. Manufacturer's Installation Instructions: Submit mounting and other structural requirements.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
Provide copies of unit's certifications by FSEC, SRCC, AS2712 and Solarkeymark.



- E. Manufacturer's Field-Reports: Indicate start-up of treatment systems and include analysis of system water after cleaning and treatment.

- 1.5 CLOSEOUT SUBMITTALS:
 - A. Operation and Maintenance Data: Spare parts lists, procedures, and treatment programs.

- 1.6 QUALITY ASSURANCE:
 - A. Perform Work in accordance with State of Texas and City of El Paso standards. B. Maintain one copy of each document on site.

- 1.7 QUALIFICATIONS:
 - A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.
 - B. Installer: Company specializing in performing Work of this section with minimum three years documented experience and approved by manufacturer.

- 1.8 PRE-INSTALLATION MEETING:
 - A. Convene minimum one week prior to commencing Work of this section.

- 1.9 DELIVERY, STORAGE, AND HANDLING:
 - A. Accept and store solar collectors and valves in shipping containers and maintain in place until installation.
 - B. Protect piping from debris and other foreign matter by using caps on piping connections.

- 1.10 FIELD MEASUREMENTS:
 - A. Verify field measurements prior to fabrication.

- 1.11 WARRANTY:



- A. Furnish five year manufacturer warranty for collectors.

1.12 MAINTENANCE SERVICE

- A. Furnish monthly technical service visits for one year starting with date of substantial completion to perform field inspections and make water analysis on site. Detail findings in writing. Submit two copies of report after each visit.

1.13 EXTRA MATERIALS:

- A. Furnish supply of chemicals for treatment and testing during warranty period. B. Furnish one extra set of mechanical seals for pumps.
- C. Furnish 1 year supply of chemicals for treatment. PART 2 –

PRODUCTS

2.1 SOLAR SYSTEM: A. Manufacturers:

1. Cinco Solar, Inc. Model CS40.
2. Substitutions: Not Permitted.

- B. The solar system will consist of a CS-40. This system is designed to act as a primary source of hot water with electric heater backup. The solar system controls are integrated into the package and communications interfaces are standard. The solar system will require 5 amps of 100-240VAC power to run the controls and pumps, and is supplied with 3/4" copper process connections.

- C. The solar system consists of the following basic equipment:

1. (1) – Evacuated 30 Tube Collector Panels;
2. (1) – Control System and Pump Station;
3. (1) – Expansion Tank;
4. Piping and fittings.

5. Flat Roof Mounting Frame.
6. Each of the system components listed above have been designed and specified to meet the highest quality standards, to provide optimum energy production, low maintenance, and maximum flexibility

2.2 SOLAR COLLECTORS:

- A. Construction: Unit consisting of manufacturers standard assembly of frame, cover, back cover with insulation, absorber plate assembly, and accessories.
- B. Solar collectors are a twin-glass evacuated tube and dry plug heat pipe system.
- C. Collector are 80" in length, 86" in width and 6.14" in height. The enclosure casing is 0.03" thick 1060-H16 grade aluminum with enamel paint finish. The copper header (water flow pipe) is of C11000 grade copper. Two contoured copper pipes of 0.7" OD x 0.04" wall form the header assembly, with all potable water connections brazed with BAg45CuZn brazing material. Each header is factory tested to 145psi. The header is insulated with compressed glass wool of no less than 3.7lbs/ft² density.
- D. The collector shall have 30 tubes. Evacuated tubes are twin tempered borosilicate glass, with outer tube wall thickness no less than 0.07" and outside diameter of 2.28". The absorber coating is AL/N on an aluminum base with a minimum absorptivity of 0.92% and maximum emissivity of 8%. Flow of heated fluid shall not be interrupted during damage or repair of absorber element. Collector is rated to withstand 1" hail.
- E. Collector instantaneous efficiency curve does not have less than a first order Y- intercept (based on gross area of 43.63ft² of 0.418, and a slope of not more than 0.206 Btu/hr.ft².°F. In other words, over a 90°C differential between ambient and heat transfer fluid temperature, collector gross efficiency does not vary more than 16%.
- F. Collector output as measured by the SRCC "C" category (36°F differential) does not drop by more than 58% between clear and cloudy conditions, and not more than 62% in SRCC category "D" (90°F differential). G. Collector is able to operate in freezing conditions as a direct water system (i.e. without the use of glycol, other antifreeze solutions and without drain-back provisions), with minimum heat loss.



- H. Heat pipes contain treated purified water only as the heat transfer liquid and provide protection against freeze related heat pipe damage. Heat pipes have a minimum wall thickness of 0.027" and are grade C10200 "oxygen free" copper.
- I. The mounting frame is 439 grade stainless steel (0.06" thick) well installed in accordance with the installation instructions, and withstands a wind load of at least 130mph. The frame shall be a high angle frame. Frame kit model FR-XX High Rfoot.
- J. Collectors have a design life of 20 years and are warranted for not less than 10 years. Collectors shall be certified by FSEC, SRCC, AS2712 and Solarkeymark.

2.3 DIFFERENTIAL CONTROLLERS:

- A. The control system shall be equipped with four relay outputs as well as two PWM outputs for the speed control of HE pumps; one PWM can be converted to 0-10V signal output. Additionally the controller is to be equipped with five PT1000 sensor inputs, two analog inputs, an impulse input, and a supplemental L output for connection to an actuator. Controller is to stage electric heater to be second stage heating.
- B. The controller shall have an integrated SD card slot for easy datalogging, as well as connection to PC or router. The controller shall have an extra large display for precise visualization of system parameters.
- C. Pre defined functions will allow simple programming and the controller shall have functions to optimize control of evacuated tube systems.
- D. Standard twin-line solar pump station for integration of the DeltaSol@FlowCon B controller. The most important hydraulic components required for the operation of a solar system are already mounted for easy and quick installation:
- E. Prepared for integration of the DeltaSol@ BS controller
- F. Solar thermal pump WILO Star ST15/6 or ST15/7
- G. Dial thermometers for flow and return

- H. Return line with ball valve and adjustable nonreturn valve
- I. Flowmeter with scale
- J. Safety assembly with relief valve and pressure gauge
- K. Fill/Drain valve for filling and flushing of the system. L. Wall mounting with screws and dowels.
- M. Heat insulation
- N. Pre-assembled and ready to plug in
- O. Pump:
 - 1. Pipe connections shall be 3/4".
 - 2. Motor shall be 1/3HP, 120 Volt, 5 Amps to produce 5 gpm per row of flow collectors @ 20Ft. Head Maximum.

2.4 PIPING:

- A. Copper Tubing: ASTM B88, Type L, hard drawn.
 - 1. Fittings: Cast brass or wrought copper.
 - 2. Joints: Grade 95TA solder joint.

2.5 INSULATION:

- A. MANUFACTURER:
 - 1. Johns Manville.
 - 2. Owens Corning.
 - 3. Knauf.

B. Insulation: ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.

1. 'K' value: ASTM C177, 0.24 at 75^o F.
2. Maximum service temperature: 650^o F.
3. Maximum moisture absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket:

1. ASTM C921, White Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers. E. Vapor

Barrier Lap Adhesive:

1. Compatible with insulation. F.

Insulating Cement/Mastic:

1. ASTM C195; hydraulic setting on mineral wool. G. Hydrous

Calcium Silicate Insulation:

1. Insulation: ASTM C533; rigid molded, asbestos free, gold color.
2. 'K' value: ASTM C177 and C518; 0.40 at 300^o F.
3. Maximum service temperature: 1200^o F.
4. Density: 15 lb/cu ft.
5. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
6. Insulating Cement:
 - a). ASTM C449/C449M.

2.6 PIPING JACKETS:

A. Aluminum Jacket: ASTM B209.

1. Thickness: 0.016 inch sheet.



2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.7 BALL VALVES:

- A. Up to 2 inch: Bronze or stainless steel one piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle, solder ends.

2.8 SWING CHECK VALVES:

- A. Up to 2 inch: Bronze swing disc, solder or screwed ends.

2.9 RELIEF VALVES:

- A. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

2.10 DIAPHRAGM TYPE COMPRESSION TANKS: A. Model -

Elbi DTS-30

- B. Furnish and install a thermal expansion tank with dimensions and capacities as scheduled on the drawings. Tank shall be built and stamped in accordance with ASME Section VIII, Div. 1 for a maximum working pressure of 150 psig and a maximum temperature of 240° F.
- C. The tank shall contain a heavy-duty butyl removable bladder, a stainless steel water connection and an air valve housed inside a protective nipple. Tanks 12 gallons and larger shall have a factory supplied heavy-duty reinforced base. All tank exteriors shall be primer coated.
- D. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check back flow preventer, test cocks, strainer, vacuum breaker, and by-pass with valves.

1. Pressure Relief Valve: 30 psig.
2. Accessories: Pressure gage and air charging fitting. 3. Size: 3/4 inch diameter.



2.11 AIR VENTS:

- A. Manual Type: Short vertical sections of 3/4 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

2.12 STRAINERS:

- A. Size 2 inch and Under: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

2.13 CONTROL VALVES:

- A. Angle or straight pattern, rising stem, globe valve for 125 psig working pressure, with bronze body and integral union for screwed connections, renewable composition disc, general purpose solenoid enclosure with continuous duty coil.

2.14 PUMPS:

- A. General Construction Requirements

1. Balance: Rotating parts, statically and dynamically.
2. Construction: To permit servicing without breaking piping or motor connections.
3. Motors: Operate at 1750 rpm unless specified otherwise.
4. Connections: Flanged.

- B. In-Line Circulators

1. Close Coupled Pumps
 - a). Type: Horizontal shaft, single stage, close coupled, for 175 psig maximum working pressure.
 - b). Construction: Cast iron casing with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge, bronze, fully enclosed impeller keyed to motor shaft extension, mechanical seal.



2. Performance:
 - a). Flow Capacity: Refer to Schedule on the Drawings. b).
 - Motor: Refer to Schedule on the Drawings.

2.15 CHEMICAL TREATMENT:

- A. System Cleaner: Liquid alkaline compound with emulsifying agents and detergents. B. Closed

System Treatment (Water):

1. Sequestering agent to reduce deposits and adjust pH.
 2. Corrosion inhibitors.
 3. Conductivity enhancers.
- C. By-pass (Pot) Feeder: 2 quart with quick opening cap 1. Drip Feeder: Plastic reservoir with coil of capillary tubing with probe, weight, charging syringe, and clip.

2.16 BACKUP ELECTRIC WATER HEATER WITH STORAGE:

- A. Refer to Section 22 30 00 Plumbing Equipment for further information.

2.17 ELECTRICAL CHARACTERISTICS AND COMPONENTS:

- A. Wiring Connections: Requirements for electrical characteristics.
 1. Refer to the schedule on the drawings for electrical information.

2.18 MANUFACTURER'S START-UP:

- A. A Solar factory representative shall provide:
 1. Pre-construction training for the installing contractor.
 2. System start-up and commissioning.
 3. Operational & maintenance training for onsite personnel.



Part 3 – EXECUTION

3.1 PREPARATION:

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions. D. After completion, fill, clean, and treat systems.

3.2 INSTALLATION:

- A. Install Work in accordance with State of Texas and City of El Paso standards.
- B. Route piping in orderly manner, installing plumb and parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space, and not interfere with use of space and other work. Group piping whenever practical at common elevations.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Maintain clearance for installation of insulation, and access to valves and fittings.
- F. Slope piping and arrange systems to drain at low points back at Equipment Room 112.
Use eccentric reducers to maintain top of pipe level.
- G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Structural for support system.
- H. Prepare pipe, fittings, supports, and accessories for finish painting. I. Install valves with stems upright.
- J. Support tanks inside building from the ground.



- K. Install drain with valve and hose connection on strainer blow down connection.
- L. Select system relief valve capacity greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment. Pipe relief valve outlet to outside and turn down 45 degrees.
- M. Verify pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- N. Make changes in piping size with reducing fittings. Support piping adjacent to pump so no weight is carried on pump casings.
- O. Install line sized shut-off valve and strainer on pump suction, and line sized check valve and balancing valve on pump discharge.
- P. Install unions downstream of valves and at equipment or apparatus connections. Q. Install threaded brass male adapters each side of valves in copper piped system.
Sweat solder adapters to pipe.
- R. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- S. Install ball valves for throttling, bypass, or manual flow control services.
- T. Install 3/4 inch ball drain valves at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest drain.
- U. Install manual air vents at system high points. Install vent tubing to nearest drain. V. Install relief valves on system at expansion tanks.

3.3 CLEANING:

- A. After completion, fill, start, and vent prior to cleaning. Use water meter to record capacity in each system. Place terminal control valves in open position during cleaning.



- B. Add cleaner to closed systems at concentration as recommended by manufacturer.
- C. Circulate for 48 hours, and then drain systems as quickly as possible. Refill with clean water, circulate for 24 hours, then drain. Refill with clean water and repeat until system cleaner is removed.
- D. Use neutralizer agents on recommendation of system cleaner supplier and acceptance of Architect/Engineer.
- E. Flush open systems with clean water for one-hour minimum. Drain completely and refill.
- F. Remove, clean, and provide new strainer screens. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed.
- G. Closed System Treatment
 - 1. Install one bypass feeder on each system. Install isolating and drain valves and interconnecting piping. Install around ball valve downstream of circulating pumps as indicated on Drawings.
 - 2. Introduce closed system treatment through bypass feeder.

3.4 SCHEDULES:

- A. Refer to schedules on the drawings.
- B. END OF SECTION 22 36 00



SECTION 22 40 00 – PLUMBING FIXTURES PART 1 – GENERAL

- 1.1 SECTION INCLUDES: A. Water closets.
B. Lavatories. C. Sinks.
D. Showers.

1.2 RELATED SECTIONS:

- A. Section 06 41 00 – Custom Casework: Preparation of counters for sinks. B. Section 06 41 00 – Custom Casework: Lavatory tops.
C. Section 07 90 00 – Joint Sealers: Seal fixtures to walls and floors. D. Section 22 11 16 – Plumbing Piping.
E. Section 22 11 19 – Plumbing Specialties. F. Section 22 30 00 – Plumbing Equipment.

1.3 REFERENCES:

- A. ANSI/NSF 61 – Drinking Water System Components – Health Effects.
B. ASME A112.18.1 – Finished and Rough Brass Plumbing Fixture Fittings. C. ASME A112.19.2 – Vitreous China Plumbing Fixtures.
D. ASME A112.19.3 – Stainless Steel Plumbing Fixtures (Designed for Residential Use). E. ASME A112.19.5 – Trim for Water-Closet Bowls, Tanks, and Urinals.
F. NFPA 70 – National Electrical Code.

1.4 SUBMITTALS FOR REVIEW:

- A. Section 01 33 00 – Submittals and Section 22 05 00 – General Mechanical Requirements: Procedures for submittals.
B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.5 SUBMITTALS FOR INFORMATION:

- A. Section 01 33 00 – Submittals and Section 22 05 00 – General Mechanical Requirements: Procedures for submittals.
B. Manufacturer's Instructions: Indicate installation methods and procedures.

1.6 SUBMITTALS AT PROJECT CLOSEOUT:



- A. Section 01 78 00 – Contract Closeout, 01 78 23 – Operation and Maintenance Data, 01 78 36 – Warranties and Section 22 05 00 – General Mechanical Requirements: Procedures for submittals.
 - B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
 - C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- 1.7 QUALITY ASSURANCE:
- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
 - B. Installer: Company specializing in performing the work of this section with minimum three years documented experience and approved by the manufacturer.
 - C. All items shall be listed and approved by NSF for their intended usage.
- 1.8 REGULATORY REQUIREMENTS:
- A. Products Requiring Electrical Connection: Listed and classified by [Underwriters Laboratories Inc.,] [testing firm acceptable to the authority having jurisdiction] as suitable for the purpose specified and indicated.
- 1.9 DELIVERY, STORAGE, AND PROTECTION:
- A. Section 22 05 00 – Material and Equipment: Transport, handle, store, and protect products.
 - B. Accept fixtures on site in factory packaging. Inspect for damage.
 - C. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.
- 1.10 WARRANTY:



A. Sections 01 77 00 – Contract Closeout, 01 78 36 – Warranties and 22 05 00 – General Mechanical Requirements
EXTRA MATERIALS:

A. Sections 01 77 00 – Contract Closeout, 01 78 23 – Operation and Maintenance Data and 22 05 00 – General Mechanical Requirements.

B. Supply two sets of faucet washers, lavatory supply fittings, [shower heads, and toilet seats.

PART 2 – PRODUCTS

2.1 TANK TYPE WATER CLOSETS: A. Bowl:

1. Manufacturer:
 - a. Eljer
 - b. American Standard
 - c. Kohler.
 - d. Crane.
 - e. Substitutions: Refer to Section 23 05 00 – Material and Equipment and Section 22 05 00 – General Mechanical Requirements
2. ASME A112.19.2; floor mounted, siphon jet, vitreous china, 18 inches high inches high close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps vandal proof cover locking device.

B. Seat:

1. Manufacturer:
 - a. Church.
 - b. Centoco.
 - c. Bath Master.
 - d. Substitutions: Refer to Section 23 05 00 – Material and Equipment and Section 22 05 00 – General Mechanical Requirements.
2. Solid white plastic, open front, brass bolts, with cover.

2.2 LAVATORIES:

A. Vitreous China Wall Hung Basin:

1. Manufacturer:

- a. Eljer
 - b. American Standard c. Kohler.
 - d. Crane.
 - e. Substitutions: Refer to Section 23 05 00 – Material and Equipment and Section 22 05 00 – General Mechanical Requirements
2. ASME A112.19.2; vitreous china wall hung lavatory 20" x 18" inch minimum, with 4 inch high back, drillings on 4 inch centers, rectangular basin with splash lip, front overflow, and soap depression.
- B. Supply Fitting:
1. ASME A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator with maximum 0.5 gpm flow, single lever handle.
- C. Accessories:
1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
 2. Offset waste with pop-up waste.
 3. Quarter turn Wheel handle stops.
 4. Flexible stainless steel supplies. D. Wall
- Mounted Carrier:
1. Manufacturer:
 - a. Zurn. b. Watts.
 - c. JR Smith d. Josam.
 - e. Substitutions: Refer to Section 23 05 00 – Material and Equipment and Section 22 05 00 – General Mechanical Requirements.
 2. ASME A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.
- 2.3 SINKS:
- A. Single Compartment Bowl:
1. Manufacturer:
 - a. Just. b. Elkay.
 - c. Substitutions: Refer to Section 23 05 00 – Material and Equipment and Section 22 05 00 – General Mechanical Requirements.
 2. ASME A112.19.3; 16" x 22" x 10" inch outside dimensions, 18 gage thick, Type



316 stainless steel, self-rimming and undercoated, with 1-1/2 inch chromed brass drain 3-1/2 inch crumb cup and tailpiece, ledge back drilled for trim.

B. Trim:

1. ASME A112.18.1; chrome plated brass supply with high rise swing spout, vandal proof water economy aerator with maximum 2.2 gpm flow, single lever handle and retractable spray.

C. Accessories:

1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
2. Offset waste with pop-up waste.
3. Quarter turn Wheel handle stops.
4. Flexible stainless steel supplies.

2.4SHOWERS: A. Trim:

1. Manufacturer:
 - a. Symmons.
 - b. Leonard Valve.
 - c. Powers.
 - d. Zurn.
 - e. Substitutions: Refer to Section 23 05 00 – Material and Equipment and Section 22 05 00 – General Mechanical Requirements.
2. ASME a112.18.1; ADA hand spray shower unit, pressure balancing mixing valve w/ integral volume control and adjustable stop screw. Balancing piston sealed operating spindle, integral stops, clear-flo 2.5 gpm shower head with arm& flange, wall/hand shower w/ 5' flex metal hose, wall connection& flange, inline vacuum breaker, 30" slide bar for hand shower mounting, polished chrome finish.

PART 3 – EXECUTION

3.1 EXAMINATION:



- A. Section 01 31 00 – Coordination and Meetings: Verification of existing conditions before starting work.
 - B. Verify that walls and floor finishes are prepared and ready for installation of fixtures. C. Verify that electric power is available and of the correct characteristics.
 - D. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.
- 3.2 PREPARATION:
- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.
- 3.3 INSTALLATION:
- A. Install each fixture with trap, easily removable for servicing and cleaning.
 - B. Provide stainless steel flexible supplies to fixtures with quarter turn handle stops, reducers, and escutcheons.
 - C. Install components level and plumb. D. Install and secure fixtures in place with wall supports or wall carriers and bolts.
 - E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 92 00, color to match fixture.
 - F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.
- 3.4 INTERFACE WITH OTHER PRODUCTS:
- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- 3.5 ADJUSTING:
- A. Section 01 70 00 – Contract Closeout: Adjusting installed work.



- B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING:

- A. Section 01 74 00 – Contract Closeout: Cleaning installed work. B. Clean plumbing fixtures and equipment.

3.7 PROTECTION OF FINISHED WORK:

- A. Section 01 77 00 – Contract Closeout: Protecting installed work. B. Do not permit use of fixtures.

3.8 SCHEDULES:

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated on architectural drawings and in compliance with ADA requirements.

- B. Fixture Rough-In, refer to plumbing schedule on

drawings for sizes.

END OF SECTION 22 40 00



DIVISION 23 – HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

SECTION 22 05 53 – MECHANICAL IDENTIFICATION PART 1 - GENERAL

1.1 SECTION INCLUDES: A. Tags

B. Pipe Markers.

1.2 RELATED SECTIONS:

A. Section 09 91 00 – Painting: Identification painting.

1.3 REFERENCES:

A. Section 01 45 00 – Quality Control and 01 42 19 – Reference Standards: Requirements for references and standards.

B. ASME A13.1 – Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS FOR REVIEW:

A. Section 01 33 00 – Submittals: Procedures for submittals.

B. Section 23 00 00 – General Mechanical Requirements for submittals.

C. Submit list of wording, symbols, letter size, and color coding for mechanical identification.

D. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

E. Product Data: Provide manufacturers catalog literature for each product required.

1.5 SUBMITTALS FOR INFORMATION:

A. Section 01 33 00 – Submittals: Procedures for submittals.



- B. Manufacturer's Instructions: Indicate installation instructions, special procedures, and installation.

1.6 SUBMITTALS AT PROJECT CLOSEOUT:

- A. Section 01 70 00 – Contract Closeout and 01 78 23 – Operation and Maintenance Data: Procedures for submittals.
- B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers. C. Valve Tag Chart.

1.7 EXTRA MATERIALS:

- A. Sections 01 70 00 – Contract Closeout and 01 78 23 – Operation and Maintenance Data.

PART 2 – PRODUCTS

2.1 TAGS:

- A. Metal Tags:
 - 1. Manufacturers:
 - a. Seton.
 - b. USA Brady. c. Panduit.
 - d. Substitutions: Refer to Section 23 05 00 – Material and Equipment and Section 23 00 00 – General Mechanical Requirements.
 - 2. Brass, Aluminum, or Stainless Steel with stamped letters; tag size minimum 1-1/2 inches diameter with smooth edges.
- B. Tag Chart: Typewritten letter size list in anodized aluminum frame and plastic laminated.

2.2 PIPE MARKERS:

- A. Color and Lettering: Conform to ASME A13.1. B. Plastic Pipe Markers:
 - 1. Manufacturers:
 - a. Seton.

- b. USA Brady. c. Panduit
- d. Substitutions: Refer to Section 23 05 00 – Material and Equipment and Section 23 00 00 – General Mechanical Requirements.
- 2. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers:

- 1. Manufacturers:
 - a. Seton.
 - b. USA Brady. c. Panduit
 - d. Substitutions: Refer to Section 23 05 00 – Material and Equipment and Section 23 00 00 – General Mechanical Requirements.
- 2. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION:

- A. Section 01 45 00 – Quality Control: Manufacturer's instructions.
- B. Install identifying devices after completion of coverings and painting.
- C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- D. Install labels with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.
- E. Install tags using corrosion resistant chain. Number tags consecutively by location. F. Identify valves in main and branch piping with tags.
- G. Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs



including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION 22 05 53



SECTION 23 06 20 – HYDRONIC SPECIALTIES PART 1 – GENERAL

1.1 SUMMARY:

- A. Section includes positive displacement meters, heat consumption meters, pressure gages and pressure gage taps, thermometers and thermometer wells, static pressure gages, filter gages. Section also includes, expansion tanks, air vents, air separators, strainers, pump suction fittings, combination fittings, flow indicators, controls, meters.

1.2 RELATED SECTIONS:

- A. Section 23 21 13 – HYDRONIC PIPING: Execution requirements for piping connections to products specified by this section.

1.3 REFERENCES:

- A. SME (American Society of Mechanical Engineers) - Boiler and Pressure Vessel Codes, SEC VIII-D – Rules for Construction of Pressure Vessels.
- B. ASME B40.1 (American Society of Mechanical Engineers) - Gauges – Pressure Indicating Dial Type – Elastic Element.
- C. ASTM E1 – Standard Specification for ASTM Thermometers.
- D. ASTM E77 – Standard Test Method for Inspection and Verification of Thermometers.
- E. ASTM A105 – Forgings, Carbon Steel, for Piping Components.
- F. ASTM A126 – Grey Iron Castings for Valves, Flanges, and Pipe Fittings.
- G. ASTM A216 – Steel Casings, Carbon, Suitable for Fusion Welding, for High Temperature Service.
- H. ASTM A395 – Ferric Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
- I. AWWA C700 (American Water Works Association) – Cold-Water Meters - Displacement Type, Bronze Main Case.
- J. AWWA C701 (American Water Works Association) – Cold-Water Meters - Turbine



Type, for Customer Service.

- K. AWWA C702 (American Water Works Association) – Cold-Water Meters - Compound Type.
 - L. AWWA C706 (American Water Works Association) – Direct-Reading Remote- Registration Systems for Cold-Water Meters. M. AWWA M6 (American Water Works Association) – Water Meters – Selection, Installation, Testing, and Maintenance.
 - N. UL 393 (Underwriters Laboratories, Inc.) – Indicating Pressure Gauges for Fire- Protection Service.
 - O. UL 404 (Underwriters Laboratories, Inc.) – Gauges, Indicating Pressure, for Compressed Gas Service.
- 1.4 SUBMITTALS:
- A. Section 01 33 00 – Submittal Procedures: Submittal procedures.
 - B. Product Data: Submit for manufactured products and assemblies used in this Project. C. Manufacturer's data [and list] indicating use, operating range, total range, accuracy, and location for manufactured components.
 - D. Submit product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
 - E. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each specialty.
 - F. Submit electrical characteristics and connection requirements.
 - G. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures, application, selection, and hookup configuration. Include pipe and accessory elevations.
 - H. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS:



- A. Section 01 70 00 – Execution Requirements: Closeout procedures.
 - B. Project Record Documents: Record actual locations of actual locations of components and instrumentation, [flow controls] [flow meters] [_____]. Submit inspection certificates for pressure vessels from [_____]. [Authority having jurisdiction.]
 - C. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction, and replacement parts list.
- 1.6 QUALIFICATIONS:
- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within [100][_] miles of Project. B. Installer: Company specializing in performing Work of this section with minimum three years documented experience and approved by manufacturer.
- 1.7 PRE-INSTALLATION MEETING:
- A. Section 01 30 00 – Administrative Requirements and 23 00 00 - General Mechanical Requirements: Pre-installation meeting.
 - B. Convene minimum one week before commencing Work of this section.
- 1.8 DELIVERY, STORAGE, AND HANDLING:
- A. Section 01 60 00 – Product Requirements and 23 00 00 – General Mechanical Requirements: Product storage and handling requirements.
 - B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
 - C. Provide temporary protective coating on cast iron and steel valves.
 - D. Protect systems from entry of foreign materials by temporary covers, caps and closures, completing sections of the work, and isolating parts of completed system until installation.
- 1.9 ENVIRONMENTAL REQUIREMENTS:



- A. Section 01 60 00 – Product Requirements and 23 00 00 – General Mechanical Requirements.
- B. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

1.10 FIELD MEASUREMENTS:

- A. Verify field measurements before fabrication.

1.11 WARRANTY:

This article extends warranty period beyond one year. Extended warranties increase construction costs and Owner enforcement responsibilities. Specify warranties with caution.

- A. Section 01 70 00 – Execution Requirements and 23 00 00 – General Mechanical Requirements: Product warranties and product bonds.
- B. Furnish [five] [_____] year manufacturer warranty for piping specialties.

1.12 MAINTENANCE SERVICE: A. Section 01 70 00 – Execution Requirements and 23 00 00 – General Mechanical Requirements: Maintenance service.

- B. Furnish [Monthly] [_____] visit for [one year] [___] starting from Date of Substantial Completion to make glycol fluid concentration analysis on site with refractive index measurement instrument. Detail findings with maintenance personnel in writing of corrective actions needed including analysis and amounts of glycol or water added.

1.13 MAINTENANCE MATERIALS:

- A. Section 01 70 00 – Execution Requirements and 23 00 00 – General Mechanical Requirements: Spare parts and maintenance materials.
- B. Furnish [two] [_____] bottles of red gage oil for static pressure gages.



1.14 EXTRA MATERIALS:

- A. Section 01 70 00 – Execution Requirements and 23 00 00 – General Mechanical Requirements: Spare parts and maintenance products. PART 2 -

PRODUCTS

2.1 PRESSURE GAGES:

- A. Gage: ASME B40.1, UL 393, UL 404 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.

1. Case: Stainless steel.
2. Bourdon Tube: Type 316 stainless steel.
3. Dial Size: 3-1/2 inch] diameter.
4. Mid-Scale Accuracy: One percent.
5. Scale: Both psi and kPa.

2.2 PRESSURE GAGE TAPS: A. Needle Valve:

1. Stainless Steel, 1 /4 inch NPT for minimum 300 psi.

2.3 DIAL THERMOMETERS:

- A. Thermometer: ASTM E1, stainless steel case, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem.

1. Size: 3 inch diameter dial.
2. Lens: Clear Lexan.
3. Accuracy: 1 percent.
4. Calibration: Both degrees F and degrees C.
5. Center of dial range shall be at the center of the dial.

2.4 TEST PLUGS:

- A. 1/4 inch NPT brass or stainless steel fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with:

1. Neoprene core for temperatures up to 200 °F.
2. Nordel core for temperatures up to 350 °F.
3. Viton core for temperatures up to 400 °F.



2.5 TEST KIT:

A. Carrying case, internally padded and fitted containing:

1. 3-1/2 inch diameter pressure gages.
2. Scale range: As required for the project's ranges.
3. Two gage adapters with 1/8 inch probes.
4. Two 1-1/2 inch dial thermometers.
 - a. Scale range: As required for the projects ranges.
 - 1). Scale range: Both degrees F and degrees C as required for the project's ranges.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gage.
- B. Install gage taps in piping
- C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.
- D. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- E. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- F. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.



- G. Locate test plugs where indicated.
 - H. Install manual air vents at system high points.
 - I. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
- 3.2 FIELD QUALITY CONTROL:
- A. Section 01 45 00 – Quality Requirements: Testing, adjusting, and balancing]. B. Test for strength of glycol and water solution and submit written test results.
- 3.3 CLEANING:
- A. Section 01 70 00 – Execution Requirements
 - B. Clean and flush glycol system before adding glycol solution.
- 3.4 PROTECTION OF INSTALLED CONSTRUCTION:
- A. Section 01 70 00 – Execution Requirements: Requirements for protecting installed construction.
 - B. Remove thermostatic elements from steam traps during temporary and trial usage, and until system has been operated and dirt pockets cleaned of sediment and scale.
 - C. Do not install hydronic pressure gauges until after systems are pressure treated.
- END OF SECTION 23 06 20



SECTION 23 21 13 - HYDRONIC PIPING

(ASTM ECOFLEX® POTABLE PEX DISTRIBUTION SYSTEM)

PART 1: GENERAL

1.01 SUMMARY

Specifier Note: The work covered by this section includes materials required to supply, install and pressure test pre-insulated potable crosslinked polyethylene (PEX) tubing manufactured by Uponor as shown on drawings or as specified. For the purpose of this specification, Uponor is hereby referred to as the tubing manufacturer relative to Uponor AquaPEX® tubing; Uponor is referred to as the piping manufacturer relative to Ecoflex pre-insulated potable piping.

- A. Section Includes: Flexible pre-insulated potable pipe distribution system that incorporates crosslinked polyethylene (PEX-a) service tubing for potable hot and cold fluid distribution systems.

Specifier Note: When specifying the manufacturer's proprietary products and recommended installation, the following References Article (1.02) may be omitted. Retain References Article when specifying products and installation by an industry reference standard. If retained, list standard(s) referenced in this section. Indicate issuing authority name, acronym, standard designation and title. Establish policy for indicating edition date of standard referenced. Conditions of the Contract or Division 1 References Section may establish the edition date of standards. This article does not require compliance with standard. It is a listing of all references used in this section.

1.02 REFERENCES

- A. General Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by the issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- B. ASTM International
 - 1. ASTM F876 Standard Specification for Crosslinked Polyethylene (PEX) Tubing
 - 2. ASTM F877 Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems
- C. American Standards Institute (ANSI)/National Sanitation Foundation (NSF)
 - 1. ANSI/NSF 61 Drinking Water System Components – Health Effects



2. ANSI/NSF 14 Plastics Piping System Components and Related Materials

D. Canadian Standards Association (CSA)

1. CSA B137.5 Standard Specification for Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications

E. Canadian Commission on Building and Fire Codes (CCBFC)

1. National Building Code of Canada, Part 7: National Plumbing Code (NPC) of Canada

F. International Code Council (ICC)

1. International Plumbing Code (IPC)

G. International Association of Plumbing and Mechanical Officials (IAPMO)

1. Uniform Plumbing Code (UPC)

H. National Association of Plumbing, Heating and Cooling Contractors (NAPHCC)

1. National Standard Plumbing Code (NSPC)

I. Uponor, Inc.

1. Uponor Pre-insulated Pipe Systems Design and Installation Manual, current edition

Specifier Note: Article below should be restricted to statements describing design or performance requirements and functional (not dimensional) tolerances of a complete system. Limit descriptions to composite and operational properties required to link components of a system together and to interface with other systems.

1.03 SYSTEM DESCRIPTION

- A. Design Requirements: The potable PEX-a service tubing is USA manufactured and tested in accordance with ASTM F876, ASTM F877, CSA B137.5 and NSF-pw. The potable PEX-a service tubing has hydrostatic ratings in accordance with the temperatures and pressures listed in the ASTM standard. The hydrostatic ratings are:

1. 200 degrees F (93 degrees C) at 80 PSI (551 kPa)
2. 180 degrees F (82 degrees C) at 100 PSI (689 kPa)
3. 73.4 degrees F (23 degrees C) at 160 psi (1102 kPa)



- B. Performance Requirements: Provide a pre-insulated potable distribution system that is USA manufactured, fabricated and installed to comply with regulatory agencies and authorities with jurisdiction, and that maintains performance criteria stated by the tubing manufacturer without defects, damage or failure.
1. Show compliance with ASTM F876 for Crosslinked Polyethylene (PEX) Tubing.
 2. Show compliance with ASTM F877 for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems.
 3. Show compliance with NSF 61 regarding Drinking Water System Components.
 4. Show compliance with CSA B137.5 regarding Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.
 5. Show compliance with ASTM F1960 regarding Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing.
 6. Show compliance with NSF-pw to indicate that the product complies with the Health-effects Requirements of NSF/ANSI Standard 61 for Materials Designed for Contact with Potable Water.

Specifier Note: Article below includes submittal of relevant data to be furnished by Contractor before, during or after construction. Coordinate this article with Architect's and Contractor's duties and responsibilities in Conditions of the Contract and Division 1 Submittal Procedures Section.

1.04 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
- B. Product Data: Submit manufacturer's product submittal data and installation instructions.
- C. Shop Drawings: Provide installation drawings indicating: piping layout, size dimension by installation segment, vault locations, support fixtures and schedules with all details required for installation of the system.
- D. Samples: Submit selection and verification samples of piping.
- E. Quality Assurance/Control Submittals
1. Test Reports: Upon request, submit test reports from recognized testing laboratories.
 2. Submit the following documentation.
 - a. Manufacturer's certificate stating that products comply with specified requirements



- b. Manufacturer's flow schedule for the distribution system
 - c. Documentation that the installer is trained to install the manufacturer's products
- F. Closeout Submittals: Submit the following documents.
- 1. Warranty documents specified herein
 - 2. Operation and maintenance data
 - 3. Manufacturer's field reports specified herein
 - 4. Final as-built piping layout drawing

Specifier Note: Article below should include statements of prerequisites, standards, limitations and criteria that establish an overall level of quality for products and workmanship for this section. Coordinate article below with Division 1 Quality Assurance Section.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Use an installer with demonstrated experience on projects of similar size and complexity and possessing documentation proving familiarization training by the tubing manufacturer.

Specifier Note: Paragraph below should list obligations for compliance with specific code requirements particular to this section. Typically, general statements to comply with a particular code are addressed in Conditions of the Contract and Division 1 Regulatory Requirements Section. Avoid repetitive statements.

- B. Regulatory Requirements and Approvals:
- 1. Ensure the pre-insulated potable PEX-a piping distribution system complies with all applicable codes and regulations.
- C. Certifications: Provide letters of certification indicating:
- 1. Installer uses skilled workers holding a trade qualification license or equivalent, or apprentices under the supervision of a licensed trades person.

Specifier Note: Retain paragraph below if pre-installation meeting is required.

- D. Pre-installation Meetings:



1. Verify project requirements, excavation conditions, system performance requirements, manufacturer's installation instructions and warranty requirements.
2. Review project construction timeline to ensure compliance or discuss modifications as required.
3. Interface with other trade representatives to verify areas of responsibility.
4. Establish the frequency and construction phase the project engineer intends for site visits and inspections by the tubing manufacturer's representative.

Specifier Note: Article below should include specific protection and environmental conditions required during storage. Coordinate article below with Division 1 Product Requirements Section.

1.06 DELIVERY, STORAGE and HANDLING

- A. General: Comply with Division 1 Product Requirement Section.
- B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
 1. Store pre-insulated potable piping coils under cover to prevent dirt or foreign material from entering the service tubing.
 2. Do not expose the potable PEX-a service tubing to direct sunlight for more than 30 days. If construction delays are encountered, cover the tubing that is exposed to direct sunlight.

Specifier Note: Coordinate article below with Conditions of the Contract and with Division 1 Closeout Submittals (Warranty) Section. Use this article to require special or extended warranty or bond covering the work of this section.

1.07 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.



- B. Manufacturer's Warranty: Submit, for owner's acceptance, USA manufacturer's standard 5-year warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights owner may have under contract documents.
1. Warranty covers the repair or replacement of any piping or fittings proven defective.
 2. Warranty may transfer to subsequent owners.
 3. The most recent limited warranty published by the manufacturer takes precedence at time of installation.

Specifier Note: List the requirements applicable to startup of the various systems. Include requirements for instruction of Owner's personnel in the operation of equipment and systems.

1.08 SYSTEM STARTUP

- A. [Specify system startup requirements.]
- B. Instruct Owner's personnel about operation and maintenance of installed system. Provide manufacturer's installation, operation and maintenance instructions for installed components within the system.

PART 2: PRODUCTS

Specifier Note: Retain article below for proprietary method specification. Add product attributes, performance characteristics, material standards and descriptions as applicable. Use of such phrases as "or equal", "or approved equal" or similar phrases may cause ambiguity in specifications. Such phrases require verification (procedural, legal and regulatory) and assignment of responsibility for determining "or equal" products.

2.01 ASTM ECOFLEX POTABLE PEX DISTRIBUTION SYSTEM

Specifier Note: Paragraph below is an addition to CSI *SectionFormat*. Retain, edit or delete paragraph below to suit project requirements and practice of Specifier.



A. Manufacturer: Uponor, Inc.

1. USA Contact: 5925 148th Street West, Apple Valley, MN 55124; Telephone: (800) 321-4739, (952) 891-2000; Fax: (952) 891-2008; Website: www.uponor-usa.com
2. Canada Contact: Uponor Ltd., 2000 Argentia Road, Plaza 1, Suite 200, Mississauga, ON L5N 1W1 Canada; Telephone: (888) 994-7726; Fax: (800) 638-9517; Website: www.uponor.ca

Specifier Note: Edit Article below to suit project requirements. If substitutions are permitted, edit text below. Add text to refer to Division 1 Project Requirements (Product Substitutions Procedures) Section.

2.02 PRODUCT SUBSTITUTIONS

- A. All products, components, etc., specified herein are manufactured by and/or available from the piping manufacturer.
- B. Alternative equipment manufacturers must submit required data for all mechanical and engineering data revisions for an equivalent ASTM piping system for approval 15 days prior to bid.
- C. Alternative equipment manufacturers must submit completed distribution design layout to the project engineer for approval. Plagiarism of another manufacturer's design is unacceptable.

Specifier Note: Specify materials to be furnished. This article may be omitted and the materials can be included with the description of a manufactured unit, equipment, component or accessory.

2.03 ASTM ECOFLEX POTABLE PEX DISTRIBUTION SYSTEM MATERIALS

- A. Service Tubing:
 1. Material: Crosslinked polyethylene (PEX) is manufactured to PEX-a or Engel-method standard and NSF-certified SDR-9.
 2. Material Standard: Materials are manufactured in accordance with ASTM F876, F877, CSA B137.5 and NSF-pw.

3. Pressure Ratings: Hydrostatic design and pressure ratings are in accordance with the ASTM standard.
4. Nominal Inside Diameter: Provide tubing with nominal inside diameter in accordance with ASTM F876, as indicated. Note: Numbers in brackets are the metric equivalent pipe size.
 - a. 1 inch [25mm]
 - b. 1¼ inch [32mm]
 - c. 1½ inch [40mm]
 - d. 2 inch [50mm]
 - e. 3 inch [75mm]

B. Outer Jacket

1. Material: Corrugated seamless high-density polyethylene (HDPE)
2. The HDPE jacket completely encompasses and protects the insulation from moisture and damage.
3. Outer jacket will be extruded directly over the insulation and is flexible.

Specifier Note: Specify materials to be furnished. This article lists product by the inside nominal dimension which is common in ASTM dimensioned tubing.

4. Minimum Bend Radius:
 - a. 1-inch pre-insulated potable tubing with 5.5-inch [140mm] jacket has a bend radius of 10 inches [254mm].
 - b. 1¼-inch pre-insulated potable tubing with 5.5-inch [140mm] jacket has a bend radius of 12 inches [304mm].
 - c. 1½-inch pre-insulated potable tubing with 6.9-inch [175mm] jacket has a bend radius of 16 inches [406mm].
 - d. 2-inch pre-insulated potable tubing with 6.9-inch [175mm] jacket has a bend radius of 18 inches [457mm].
 - e. 3-inch pre-insulated potable tubing with 7.9-inch [200mm] jacket has a bend radius of 32 inches [812mm].
5. The outer jacket shall contain 2 percent carbon black, finely divided and thoroughly dispersed to provide protection from UV degradation.

C. Insulation

1. The insulation will be layered expanded cross-linked water-resistant polyethylene closed-cell foam.
2. All seams of the insulation will be sealed.
3. Insulation shall not be bonded to the service tubing.

D. End Seals

1. The piping manufacturer will supply all EPDM rubber end caps with water-stop seal.
2. EPDM rubber end caps are to be installed on each end prior to connecting the service pipes and insulating the field joints.
3. The EPDM end caps will seal onto the tubing and outer jacket forming a watertight seal.

Specifier Note: Two fitting programs are available for the PEX Service Tubing. Normally one fitting type is specified on the project. In this case, delete the other fitting reference. It is acceptable to specify both fittings allowing the installing contractor to choose the type of fitting used. For standardization, the installing contractor should only use one type of fitting for the installation.

E. Cold Expansion Fittings for PEX-a Service Tubing

1. For system compatibility, use fittings offered by the tubing manufacturer.
2. Fittings must comply with the performance requirements of ASTM F877.
3. Fittings are to be manufactured in accordance with ASTM F1960.
4. The fitting assembly consists of a barbed adapter and an applicable-sized PEX ring.
5. All buried fittings will be installed, insulated, and sealed in accordance with the instructions of the piping manufacturer.

F. Compression Fittings for PEX-a Service Tubing

1. For system compatibility, use fittings offered by the tubing manufacturer.
2. Fittings are to be manufactured from dezincification-resistant brass and lead-free brass.
3. The fitting assembly must comply with performance requirements of ASTM F877.

4. Fittings will consist of a compression fitting with a coupling sleeve, a fitting body insert with o-ring(s) and a bolt and nut.
5. All buried fittings will be installed, insulated, and sealed in accordance with the piping manufacturer's instructions.
6. Male NPT thread for each compression fitting is shown below.
 - a. 1-inch PEX compression fitting has 1-inch male NPT thread.
 - b. 1¼-inch PEX compression fitting has 1¼-inch male NPT thread.
 - c. 1½-inch PEX compression fitting has 1½-inch male NPT thread.
 - d. 2-inch PEX compression fitting has 2-inch male NPT thread.
 - e. 3-inch PEX compression fitting has 2½-inch male NPT thread.
7. All transition fittings connecting to the compression fittings will be manufactured of dezincification-resistant brass.

2.04 PIPE AND FITTING IDENTIFICATION

- A. The pipe shall be marked in accordance with the standards to which it is manufactured.
- B. Color identification by the use of stripes on pipe to identify pipe service shall be optional. If used, stripes or colored exterior pipe product shall be blue for potable water, green for wastewater/sewage, or purple for reclaimed water. [Optional]
- C. Tracing wire shall be placed parallel and 18 inches above, but separate from, the pipe and shall be 10 AWG. [Specifier can change this to preferred material or method; all pipes should have a locatable methodology.]
- D. Marking tape shall be approved by the engineer and placed between 12 and 18 inches above the crown of the pipe. [Optional]

2.05 ACCESSORIES



- E. Use accessories associated with the installation of the ASTM Ecoflex Potable PEX distribution piping system as recommended by or available from the manufacturer.

- F. Insulation Kits
 - 1. Insulation kits will be manufactured of ABS shells or HDPE sleeves, will feature equal thickness of closed-cell PEX insulation as the pipe, and sealed watertight.

- G. Connection Vaults
 - 1. The piping manufacturer will provide the connection vaults when required by the project construction.
 - 2. Connection vaults will be constructed of rotationally molded composite polyethylene and PE foam, providing a structurally sound and thermally insulated chamber.
 - 3. Heat shrink seals as provided by the tubing manufacturer will be installed to prevent introduction of water into the vault.

- D. Anchors
 - 1. The project engineer will determine the use of anchors, if required, within the distribution system.

PART 3: EXECUTION

Specifier Note: Article below is an addition to the CSI *SectionFormat*. Revise article below to suit project requirements and specifier's practice.

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Comply with manufacturer's product data, including product technical bulletins, installation instructions and design drawings, including:
 - 1. Uponor Pre-insulated Pipe Systems Design and Installation Manual, current edition

Specifier Note: Specify actions to determine that conditions are acceptable to receive primary products of the section.



3.02 EXAMINATION

A. Site Verification of Conditions

1. Verify that site conditions are acceptable for installation of the pre-insulated potable PEX-a piping distribution system.
2. Do not proceed with installation until unacceptable conditions are corrected.

Specifier Note: Coordinate article below with manufacturer's recommended installation requirements.

3.03 INSTALLATION

A. Below-grade Installation

1. Potable pre-insulated piping will be installed in accordance with manufacturer's recommendations and the details as shown on the contract drawings.
2. The system will be installed with the fewest number of underground joints as possible.
3. The system does not require expansion loops, expansion joints or compensators of any type.
4. An EPDM rubber end cap will be applied at all terminations of the pre-insulated potable piping system, including all fitting locations, to form a watertight seal.
5. All buried fittings will be installed, insulated and sealed in accordance with the instructions of the piping manufacturer.
6. Connection Vaults or Insulation Kits are required for all below-grade installations.

B. Backfill

1. The pre-insulated potable piping system will be backfilled with clean sand material.
 - a. Minimum vertical distance from the bottom of the tubing to the trench floor is 4 inches [100mm].
 - b. Minimum lateral distance from the side of the tubing to the trench wall is 6 inches [150mm].
 - c. Install a minimum of 12 inches [300mm] of clean fill over the top of the pre-insulated potable piping.



2. The balance of the trench can be backfilled with native soil void of stone greater than 2 inches [50mm] in diameter.

Specifier Note: Specify the tests and inspections required for installed or completed work.

3.04 FIELD QUALITY CONTROL

A. Site Tests

1. To ensure system integrity, pressure-test the tubing before and during backfilling of the piping.
2. The service tubing will be air tested at 1½ times the operating pressure for a minimum of 1 hour prior to system burial.

Specifier Note: Specify the final actions required to prepare installed equipment or other completed work to properly function or perform.

3.05 ADJUSTING

A. [Specify any required adjustments to the system.]

Specifier Note: Specify the final actions required to clean installed equipment or other completed work to properly function or perform. Coordinate article below with Division 1 Execution Requirements (Cleaning) Section.

3.06 CLEANING

- A. Remove temporary coverings and protection of adjacent work areas.
- B. Repair or replace damaged installed products.
- C. Clean the installed products in accordance with manufacturer's instructions prior to Owner's acceptance.
- D. Remove construction debris from project site and legally dispose of debris.

Specifier Note: Specify requirements of the installer or manufacturer to demonstrate or train the Owner's personnel in the operation and maintenance of equipment.

3.07 DEMONSTRATION

- A. Demonstrate operation of the ASTM Ecoflex Potable PEX piping distribution system to Owner's personnel.



Specifier Note: Specify provisions for protecting work after installation but prior to acceptance by the Owner. Coordinate article below with Division 1 Execution Requirements Section.

3.08 PROTECTION

- A. Protect installed work from damage caused by subsequent construction activity on the site.

END OF SECTION



SECTION 23 21 23 – HVAC PUMPS PART 1 – GENERAL

- 1.1 SECTION INCLUDES: A. In-line circulators.
B. Vertical in-line pumps. C. Close coupled pumps. D. Base mounted pumps.
E. Dual-drive pumping system. F. Side-stream filters.

1.2 RELATED SECTIONS:

- A. Section 03 30 00 – Cast-in-Place Concrete. B. Section 23 05 13 – Motors.
C. Section 23 05 48 – Vibration Isolation.
D. Section 22 07 19 – Piping Insulation.
E. Section 15280 – Equipment Insulation. F. Section 23 21 13 – Hydronic Piping.
G. Section 23 06 20 – Hydronic Specialties.
H. Section 26 05 03 – Equipment Wiring Systems: Electrical characteristics and wiring connections.

1.3 REFERENCES:

- A. UL 778 – Motor Operated Water Pumps. B. NFPA 70 – National Electrical Code.

1.4 PERFORMANCE REQUIREMENTS:

- A. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.5 SUBMITTALS:

- A. Submit under provisions of Section 01 33 00 and 23 00 00.
B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve and impeller size. Include electrical characteristics and connection requirements. Submit data indicating dimensions, rough-in connections, and electrical characteristics and connection requirements. Submit capacity and dimensions of manufactured products and assemblies required for this Project. Indicate electrical service with electrical



characteristics and connection requirements, and duct connections. Submit data for manufactured products and assemblies. Indicate water, drain valves, service maintenance and access clearances, and electrical rough-in connections with electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.

D. Millwright's Certificate: Certify that base mounted pumps have been aligned.

1.6 OPERATION AND MAINTENANCE DATA:

A. Submit under provisions of Section 01 78 23 and 23 00 00.

B. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.7 QUALIFICATIONS:

A. Manufacturer: Company specializing in manufactures, assembly, and field performance of pumps with minimum three documented year's experience.

B. Alignment: Base mounted pumps shall be aligned by qualified millwright.

1.8 REGULATORY REQUIREMENTS:

A. Products Requiring Electrical Connection: Listed and classified by [UL] [testing firm acceptable to the authority having jurisdiction] as suitable for the purpose specified and indicated.

1.9 EXTRA MATERIALS:

A. Furnish under provisions of Section 01 70 00 and 23 00 00.

B. Provide [one] [] set of mechanical seals for [each] [] pumps. C. Provide [2] [] sets of cartridges for each side-stream filter.

PART 2 – PRODUCTS



2.1 MANUFACTURERS:

- A. Bell & Gossett (B&G). B. TACO.
- C. PACO.

- D. Armstrong.

- E. Substitutions: Refer to Section 23 05 00 – Material and Equipment and Section 23 00 00 – General Mechanical Requirements.

2.2 SYSTEM LUBRICATED CIRCULATORS:

- A. Type: Horizontal shaft, single stage, direct connected with multiple speed wet rotor motor for in-line mounting, for 140 psig maximum working pressure, 230 degrees F maximum water temperature.
- B. Casing: [Cast iron] [Bronze] with flanged pump connections.
- C. Impeller, Shaft, Rotor: Stainless Steel. Factory trim the impeller to match the specified flow. D. Bearings: Metal Impregnated carbon (graphite) and ceramic.
- E. Motor: Impedance protected, [multiple] [single] [two] [three] speed [, with external speed selector].
- F. Performance: Refer to pump schedule on drawings for information.
- G. Electrical Characteristics: Refer to pump schedule on drawings for information.

2.3 IN-LINE CIRCULATORS:

- A. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in-line mounting, oil lubricated, for [125 psig] [175 psig] maximum working pressure.
- B. Casing: Cast iron, with flanged pump connections.
- C. Impeller: [Cadmium plated steel,] [Stamped brass or cast bronze,] keyed to shaft. Factory trim the impeller to match the specified flow



- D. Bearings: Two, oil lubricated bronze sleeves.
- E. Shaft: Alloy or stainless steel with copper or bronze sleeve, integral thrust collar.
- F. Seal: Carbon rotating against a stationary ceramic seat, [225] [212] [_____] degrees F maximum continuous operating temperature.

***** OR *****

- G. Seal: Carbon rotating against a stationary ceramic seat, viton fitted, 275 degrees F (135 degrees C) maximum continuous operating temperature.
- H. Drive: Flexible coupling.
- I. Performance: Refer to pump schedule on drawings for information.
- J. Electrical Characteristics: Refer to pump schedule on drawings for information.
 - 1. Motor: 1750 rpm unless specified otherwise; refer to Section 15170.
 - 2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

2.4 VERTICAL IN-LINE PUMPS:

- A. Type: Vertical, single stage, close coupled, radially [or horizontally] split casing, for in-line mounting, for [175 psig] [250 psig] [300 psig] working pressure.
- B. Casing: [Cast iron,] [Cast steel,] with suction and discharge gage port, casing wear ring, seal flush connection, drain plug, flanged suction and discharge.
- C. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension. Factory trim the impeller to match the specified flow
- D. Shaft: Carbon steel with stainless steel impeller cap screw or nut [and bronze sleeve].
- E. Seal: Carbon rotating against a stationary ceramic seat, [225] [212] [_____] degrees F maximum continuous operating temperature.



***** OR *****

- F. Seal: Carbon rotating against a stationary ceramic seat, viton fitted, 275 degrees F maximum continuous operating temperature.

***** [OR] *****

- G. Seal: Packing gland with minimum four rings graphite impregnated packing and bronze lantern rings, [230] [250] [_____] degrees F maximum continuous operating temperature.
- H. Performance: Refer to pump schedule on drawings for information.
- I. Electrical Characteristics: Refer to pump schedule on drawings for information.
 - 1. Motor: 1750 rpm unless specified otherwise; refer to Section 15170.
 - 2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
- 2.5 CLOSE COUPLED PUMPS: A. Type: Horizontal shaft, single stage, close coupled, radially split casing, for [125 psig] [175 psig] [250 psig] maximum working pressure.
 - B. Casing: Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.
 - C. Impeller: Bronze, fully enclosed, keyed to motor shaft extension. Factory trim the impeller to match the specified flow
 - D. Shaft: Stainless steel.
 - E. Seal: Carbon rotating against a stationary ceramic seat, [225] [212] [_____] degrees F] maximum continuous operating temperature.

***** OR *****

- F. Seal: Carbon rotating against a stationary ceramic seat, viton fitted, 275 degrees F



maximum continuous operating temperature.

***** [OR] *****

- G. Seal: Packing gland with minimum four rings graphite impregnated packing and bronze lantern rings, 230 degrees F maximum continuous operating temperature.
- H. Performance: Refer to pump schedule on drawings for information.
- I. Electrical Characteristics: Refer to pump schedule on drawings for information.
 - 1. Motor: 1750 rpm unless specified otherwise; refer to Section 23 05 13.
 - 2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

2.6 BASE MOUNTED PUMPS:

- A. Type: Horizontal shaft, single stage, direct connected, radially [or horizontally] split casing, for [125 psig] [175 psig] [250 psig] maximum working pressure.
- B. Casing: Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.
- C. Impeller: Bronze, fully enclosed, keyed to shaft. Factory trim the impeller to match the specified flow
- D. Bearings: [Oil] [Grease] [Permanently] lubricated roller or ball bearings. E. Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.
- F. Seal: Carbon rotating against a stationary ceramic seat, [225] [212] [_____] degrees F] maximum continuous operating temperature.

***** OR *****

- G. Seal: Carbon rotating against a stationary ceramic seat, viton fitted, 275 degrees F maximum continuous operating temperature.

***** [OR] *****



- H. Seal: Packing gland with minimum four rings graphite impregnated packing and bronze lantern rings, 230 degrees F maximum continuous operating temperature.
 - I. Drive: Flexible coupling with coupling guard.
 - J. Baseplate: Cast iron or fabricated steel with integral drain rim.
 - K. Performance: Refer to pump schedule on drawings for information.
 - L. Electrical Characteristics: Refer to pump schedule on drawings for information.
 - 1. Motor: 1 750 rpm unless specified otherwise; refer to Section 23 05 13.
 - 2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
- 2.7 DUAL DRIVE PUMPING SYSTEM:
- A. Pumping System: Horizontal split case, base mounted pump with two motors, operating at 1750 rpm and 1150 rpm, assembled on integral base with control cabinet.
 - B. Control Cabinet: NEMA 1, UL approved enclosure with individual circuit breakers, magnetic starters with overload protection, running lights, separate 115V fused control circuit, hand-off-automatic switches, [motor failure alarm with manual reset,] pre-wired.
 - C. Electrical Characteristics:
 - 1. 1750 rpm: [____] hp ([____] kW).
 - 2. 150 rpm: [____] hp ([____] kW).
 - 3. [____] volts, [single] [three] phase, 60 Hz.
 - 4. Refer to Section 16180.
 - 5. Motors: [Refer to Section 23 05 13.] [NEMA MG1, [____].]
 - 6. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
- 2.8 SIDE-STREAM FILTRATION SYSTEM:
- A. System: Flow indicator, filter housing with cartridge filter, shut-off valves, and flow control valve. B. Performance: Design flow [4] [____] gal/min with maximum pressure drop of [3] [____] psig.
 - C. Hot Water [and Glycol] Filter Housing: Glass reinforced nylon plastic suitable for 220 degrees F and 200 psig operating conditions.
 - D. Chilled Water Filter Housing: Reinforced polypropylene plastic housing suitable for 125 degrees F and 125 psig operating conditions.
 - E. Cartridges: 30 micron for start-up and 5 micron for system operation.
- 2.9 OPERATING FLUID:



A. Chilled water system shall have xx% Glycol/yy% water. B. Heating water system shall have xx% Glycol/yy% water.

C. Heat Pump water system shall have xx% Glycol/yy% water. PART 3 –

EXECUTION

3.1 PREPARATION:

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION:

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer. Install equipment with and maintain all service clearances as required or recommended by the manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close coupled or base mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches and over. [Refer to Section 15245.]

D. Provide line sized shut-off valve and [strainer] [pump suction fitting] [_____] on pump suction, and line sized [soft seat check valve and balancing valve] [combination pump discharge valve] on pump discharge.

E. Provide air cock and drain connection on horizontal pump casings.

F. Provide drains for bases and seals, piped to and discharging into floor drains. G. Check, align, and certify alignment of base mounted pumps prior to start-up.

H. Install [close coupled and] base mounted pumps on concrete housekeeping base, with anchor bolts, set and level, and grout in place. Refer to Section 03 30 00. I. Lubricate pumps before start-up.

J. Provide side-stream filtration system for [heating water] [,] [chilled water] [,] [glycol] [,] [brine] systems. Install across pump with flow from pump discharge to pump suction from pump tapplings.

3.3 SCHEDULES:

A. Refer to pump schedule on drawings for information. END OF SECTION 23 21 23



DIVISION 25 – INTEGRATED AUTOMATION

DIVISION 26 – ELECTRICAL

SECTION 26 05 00 – ELECTRICAL GENERAL PROVISIONS PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Drawings: Refer to the E-series drawings for graphic representations, schedules and notations showing electrical work.
- B. Specifications: Refer to the Division 26 sections for the primary technical specifications of electrical work.
- C. This work includes furnishing and installing all electrical material, accessories, supports, conduit, wire, connections, grounding, excavating and all other labor and materials indicated on the drawings or specified herein and required by codes. This includes all electrical materials and connections required for operation of all items of equipment furnished under other sections of these specifications. For clarity some items may be noted as "BY ELECTRICAL CONTRACTOR" or "IN THIS CONTRACT".
- D. Work Included:
 - 1. The work under this section is not limited to, but shall include:
 - 2. Electric service conduits and cables and utility company service charges.
 - 3. Coordinate with electrical utility company and provide metering facilities to comply with utility company requirements.
 - 4. Coordinate with Telephone Company and provide telephone service conduits to comply with telephone company installation requirements.
 - 5. Main metering switchboard, panelboards and feeders for a complete power and lighting distribution system.



6. Lighting fixtures, lamps, outlet boxes, conduit, wiring devices, control components, buck-boost transformers, powers supplies for low-voltage lighting fixtures, and accessories.
7. Conduit, wiring and connections for all line voltage electrical equipment furnished and installed by others (see Mechanical, Refrigeration, Fire Control drawings).
8. Conduit and wire for low voltage controls. Final connections by electrical contractor.
9. Permit, plan check and inspection fees.
10. Starters and disconnects for all fan motors. These shall include all components to make shunting under hoods fully operational.
11. Any fees or assessments required by local authorities are a part of the electrical contract.
12. Installation of ceiling fans by ELECTRICAL CONTRACTOR.
13. Motors.
14. Connection of low voltage wiring to air conditioning controls (except as shown on plans).
15. Occupancy sensor low voltage circuits/power paks.

E. Equipment provided under other sections, but connected under this section:

1. Mechanical.

1.3 BIDDING:

- A. All electrical equipment shall be new unless specified otherwise in the specifications or on the drawings.
- B. All bids must be based only on the equipment and materials as scheduled on the drawings and as specified or on equivalent equipment and materials from a pre-approved alternative manufacturer. No bid may be based on a substituted or other alternative without specific written prior approval from the Engineer. Any Contractor who assumes equivalence of products and who bases his bid on that assumption does so at his own risk.
- C. A listing of approved alternative manufacturers does not mean that all products of a particular alternative manufacturer are acceptable alternative to the scheduled items; it merely means that for bidding prior approval is not required. All fixtures and devices must still be submitted according to the prescribed procedures. In addition, some items that have an important visual affect, e.g. electric water coolers, may be required to receive Owner's or Architectural approval also.



1.4 COORDINATION OF ELECTRICAL WORK:

- A. General: Refer to the Division 1 sections for general coordination requirements applicable to the entire work. It is recognized that the contract documents are diagrammatic in showing certain physical relationships, which must be established within the electrical work, and in its interface with other work including utilities and mechanical work, and that such establishment is the exclusive responsibility of the Electrical Subcontractor.
- B. Arrange electrical work in a neat, well organized manner with conduit and similar services running parallel with primary lines of the building construction, and with a minimum of 8'-0" overhead clearance where possible.
- C. The electrical plans are diagrammatic, but shall be followed as closely as actual construction and the work of the other trades will allow. Such minor changes as are necessary to make the electrical work conform to the work of other trades and to the building shall be made without cost to the Owner.
- D. The maximum number of circuits combined in one raceway shall be three; however, no circuit shall be combined without prior approval of the Engineer or unless specifically shown on the drawings.
- E. The Electrical Subcontractor shall not combine circuits not shown to be combined. Furthermore, this electrical subcontractor shall not extend circuits, shown on the drawings as routed in the floor, overhead or extend circuits, shown on the drawings as routed overhead, in the floor, without first obtaining approval from the Engineer. This electrical subcontractor shall not prepare and/or use electrical subcontractor prepared rough-in drawings without first obtaining approval from the Engineer.
- F. Where unauthorized design changes are found, the work shall be disapproved and the contractor shall remove the work and extend it as shown on the Drawings.
- G. The Electrical Contractor shall coordinate the installation of electrical conduits with any cable tray to maintain required clearances.

1.5 QUALITY ASSURANCE AND STANDARDS:

- A. General: Refer to Division 1 for general administrative/procedural requirements related to compliance with codes and standards. Specifically, for the electrical work (in addition to standards specified in individual work sections), the following standards are imposed, as applicable to the work in each instance:



1. ANSI C 2, National Electrical Safety Code.
2. NECA standards for installation.
3. NEMA standards for materials and products.

1.6 LAWS, CODES AND ORDINANCES:

- A. All work and material shall conform to the requirements of OSHA and all national and state Laws and ordinances having jurisdiction at the job site. The (NEC) National Electrical Code, 2011 Edition, or latest edition being enforced, shall be strictly adhered to. NEC requirements are considered "minimum requirements". Where requirements of the contract documents exceed NEC, the contract documents govern.
- B. Secure permits and pay permit and inspection fee as required by local authorities.
- C. Upon completion of the work, furnish to the Owner a certificate of final inspection and approval from the electrical inspection bureau having jurisdiction.
- D. All electrical systems shall be grounded in strict accordance with the requirements of the National Electrical Code.

1.7 INDUSTRY PUBLICATION STANDARDS:

- A. The publications and standards of the latest issue at the time of bid, of the following organizations, where referenced in these specifications or on the drawings, shall apply:
 1. ANSI-American National Standards Institute.
 2. ASTM-American Society of Testing and Materials.
 3. CBM-Certified Ballast Manufacturers Association.
 4. IEEE-Institute of Electrical and Electronic Engineers.
 5. IPCEA-Insulated Power Cable Engineers Association.
 6. NEC-National Electrical Code.
 7. NECA-National Electrical Contractors Association.



8. NEMA-National Electrical Manufacturers Association.
9. NESC-National Electrical Safety Code.
10. NFPA-National Fire Protection Association.
11. UL-Underwriters Laboratory.
12. IESNA-Illuminating Engineering Society of North America.

1.8 EXISTING UTILITIES:

- A. The drawings indicate the locations, type and sizes of various utilities within the site where known. These utilities are indicated as accurately as possible. If the Contractor encounters any utilities or differing conditions during construction, which are not shown on the drawings, they shall request in writing for written instructions from the Architect and/or Engineer. Any relocation or remodeling required will then be directed by a change order. This Contractor shall assume all responsibility for protection of all utilities, shown or not, and for repair required by this construction.
- B. Contractor shall verify location, size, elevation, and any other pertinent data of the existing utilities. The Contractor shall provide a written report with drawings indicating this existing utilities information, such as utility locations information. Additional costs incurred due to failure to verify such data and to coordinate associated work with respective utility providers shall not be the Owner's responsibility but shall be borne by the Contractor.
- C. All costs associated with providing utilities including, but not limited to, connection fees, meters, boring under roads, etc., shall be included in the Contractor's bid price whether such costs are incurred by Contractor or charged by the utility company.
- D. Submission of a bid by the Contractor shall be considered an acknowledgment by the contractor of his compliance with this section.
- E. The Contractor shall coordinate with Owner, Architect, and this Engineer's office any work that has the potential to hinder electrical services to areas outside this contract. All shut downs or tie-ins relating to these systems shall be scheduled and submitted in writing to be approved by the Owner, Architect, and this Engineer's office. Contractor shall submit in writing a schedule of construction phasing that indicates areas of first priority during each phase and anticipated completion times. Schedules shall be submitted a minimum of 7 days prior to commencing work. Owner, Architect, and this Engineer's office shall review these schedules and notify the contractor of acceptance prior to commencement of work.

1.9 SUBMITTALS:



- A. General: Refer to Division 1 for general requirements concerning work related and administrative submittals. All descriptive and technical data and shop drawings shall bear signed certification by the Electrical Subcontractor to the effect that they have been carefully examined and found to be correct with respect to dimension, space available, non-interference with other trades and that the equipment complies with all the requirements of these specifications. Submittals will be rejected if signed certification is not included. Where catalog data are submitted, the proposed items shall be clearly "flagged" or otherwise identified, so that no confusion exists. Site lighting substitutions shall meet performance specifications indicated on lighting plan. Substitute interior specialty lighting fixtures shall be approved by the engineer and owner 10 days prior to bid date.
- 1.10 DRAWING AND DRAWING CONFLICTS:
- A. Contract drawings are diagrammatic only and are not intended to be scaled for dimensions. All dimensions shall be taken from Architectural drawings, certified equipment drawings and from the structure itself before fabricating and work. All space requirements shall be verified, coordinated with other trades, as it is the various Contractors' responsibility to install the systems complete in the space provided without extra charges to the Owner.
- B. It is intended that anything, including labor and materials, which is usually furnished as part of any equipment specified and which is necessary for operation shall be furnished as part of the Contract without additional cost, whether or not shown or described.
- C. All piping in finished areas of the building shall be concealed except where otherwise noted on the drawings.
- D. All equipment shall be installed in accordance with manufacturer's recommendations, unless approval is given in writing by the Consulting Electrical Engineer for deviation prior to commencement of work.
- E. In the event of a conflict or inconsistency between items indicated on the drawings and in the specifications or conflicts with code requirements applying to the same item, that drawing indication, note, specification or code which prescribes and establishes the higher standard, provides for a better grade of material or provides a more complete job shall take precedence. The Contractor shall notify Engineer and Architect to obtain a clarification.
- F. All materials not approved by Engineer and Architect and all material not properly installed, shall be promptly removed from the premises by the Contractor, whether or not it has been incorporated into the work. The Contractor shall then promptly replace and reconnect all work in accordance with the drawings and specifications, at his own expense, and shall also bear the expense of restoring all work of other trades damaged or dislocated by such removal or replacement.



- G. Should the Contractor refuse to remove and replace unsatisfactory materials and installation, and restore work of other trades after having been notified by Engineer and Architect, then Engineer/Architect and owner shall have the right to enter upon the work and procure such materials and labor required to remove and replace all unsatisfactory work and restore work of other trades, in order to complete the project. All costs incurred by Owner/Engineer/Architect for such corrective work shall be borne by the Contractor.
- H. Submittals shall indicate minimum access and service clearances for the submitted equipment.
- 1.11 STRUCTURAL CONDITIONS - SPECIAL NOTE:
- A. Where conduits, sleeves, inserts, supports, cabinets, fixtures and other material are to be attached to, pass through, or interfere with, any structural member, or where notching, boring or cutting of any structural member is necessary, or where special openings are required through floors, footings, foundations, walls, roofs, or other structural elements to accommodate the electrical work, this Contractor shall obtain the approval of Owner/Engineer/Architect and shall coordinate all such work with the General Contractor, and other trades. The Electrical Contractor shall perform all such work and shall patch and repaint all members and surfaces damaged or soiled in performing the electrical installation, unless specifically instructed otherwise.
- B. Where conduits pass through walls or foundations, seal around conduits to make the work watertight. Where conduits pass through roofs, provide galvanized metal flashing and seal with a suitable compound, intended for the purpose to make the work watertight.
- C. See schematics and plans for conduits through roof on Architectural and M/E/P drawings.
- 1.12 WARRANTY:
- A. All materials and equipment shall be new unless otherwise specified.
- B. Guarantee all workmanship, material and equipment and replace any found defective without cost to the Owner, for ONE year after final acceptance, as defined in General Conditions.
- C. Each warranty for longer than one year as described above (that comes with equipment used on the job) shall be passed into the Owner in the Operation and Maintenance Manual, along with the dates of start and end of warranty.
- D. Refer to General Conditions for additional information regarding specific warranty requirements.



1.13 PROJECT RECORD DOCUMENTS:

- A. Before final payment, provide the Architect with one clean set of drawings and specifications corrected up-to-date as job progress. These documents shall reflect the As-Built conditions. Refer to General Conditions for additional information.

1.14 SUBMITTALS:

- A. The intent of this section is to give general submittal information, refer to specific submittal information in the subsequent electrical sections.
- B. Within 10 days after award of the contract, and before orders are placed, Contractor shall submit specific information on list of equipment and principal materials specified. Contractor shall indicate and/or provide names of manufacturers, catalog and model numbers, cut sheets, and such other supplementary information as necessary for evaluation. Minimum of six (6) copies, or as directed by the Engineer, of each shall be submitted and shall include all items mentioned by model number and/or manufacturer's name in the specifications or in schedules on the drawings.
- C. Requirements for each submittal:
 - 1. Bear a dated stamp or specific written indication that the Contractor has reviewed and approved all submittal prior to submission to Engineer,
 - 2. Have all information deleted by Contractor that pertains to the means and methods of construction or to fabrication, assembly, installation, or erection
 - 3. **BE CLEARLY AND SPECIFICALLY** marked as to which specific piece of equipment is being submitted, by use of a permanent marker, stamp, etc., so as to distinguish it from other pieces of equipment that may occur on the same page,
 - 4. **BE CLEARLY AND SPECIFICALLY** marked as to which available options are being submitted that are associated with a piece of equipment, and
 - 5. Be complete with respect to quantities, dimensions, specific performance, materials, and similar data to enable the Engineer to review the proposed equipment.
 - 6. Omission by Contractor of any of the above requirements or submittals will subject submittal to automatic rejection without review.
 - 7. Any submittals received by Engineer that were not requested shall be returned without review of any kind.
- D. Installation Instructions – For certain products or systems as identified in subsequent specifications sections or on the drawings, the Contractor shall be required to provide copies of manufacturer's installation instructions with the submittal. When required as such, the installation instructions are



considered part of the submittal and their omission may result in automatic rejection of the submittal. Where more than one identical device are scheduled, only one set of installation instructions needs to be submitted, e.g. if seven five-ton split systems air conditions are scheduled, only one five-ton unit installation instruction needs to be submitted. Similarly, if one set of installation instructions is identified by the manufacturer and on the instructions to be applicable to more than one type or size of devices, e.g. if one set of air conditioner instructions is good for three, four, five-ton units, then only one instruction set is required for these devices.

- E. This Engineer will review the submittals for approval twice. Any additional reviews that are required by the engineer for whatever reason after the initial two reviews will result in additional compensation for the Engineer's time by the submitting Contractor at the Engineer's rate.

1.15 SUBSTITUTED PRODUCTS:

- A. Material or equipment specified by Manufacturer's name is being used as a basis of standard. No substitution is allowable without Engineer's written approval **TEN (10) DAYS PRIOR TO BID DUE DATE** unless the manufacturer is listed on the drawings or in the specification as being a preapproved alternative manufacturer. Any submittal received without such written approval or prior approval is subject to unqualified rejection.
- B. It shall be the Contractor's responsibility to verify that submitted substitute equipment will fit in space available. The contractor's submittal for acceptance of the substitute shall include a written statement of whether or not such acceptance would require any subsequent or associated changes to the drawings or specifications. Any such changes shall be described in writing, briefly but complete.
- C. The Contractor shall be responsible for the costs of any such modifications due to substitution of materials or equipment for that which was specified or scheduled. The
- D. The Engineer may request detailed shop drawing or plan layouts of electrical rooms or systems of the substituted equipment.

1.16 SAFETY:

- A. General – Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work, and Contractor shall comply with all laws governing safety, specifically the "Occupational Safety and Health Standards" and the "Safety and Health Regulations for Construction", state and federal.
- B. According to OSHA, a hazardous chemical is any chemical, which is a physical hazard or a health hazard. This may include items such as paints, solvents, adhesives, sealants, cleaners, etc. If a



contractor produces, uses, or stores hazardous chemicals at the workplace, then contractor shall develop, implement, and maintain a hazard communication program in compliance with the latest OSHA requirements. In projects with multiple tenants in which the building is partially occupied during all or part of the project, Contractor shall inform the building manager or Owner, according to OSHA guidelines, of any hazardous chemicals being produced, stored, or used in the building so that other tenants may be notified. Contractor shall employ required methods of training, information, handling, ventilation, labeling, storing, disposal, and removal of hazardous chemicals.

1.17 LABELING:

- A. Each device for which an independent testing authority has established a standard shall have affixed a label indicating its compliance and listing. Refer to General Conditions for list of such independent testing authorities.

1.18 SITE VISIT REPORTS:

- A. During the course of the job, the Engineer will make site visits to observe work in progress and will subsequently prepare a written site visit report, which will be sent to the Contractor and to whomever else the Engineer desires. The Contractor shall prepare a written and typed response within seven (7) calendar days of his receiving the site visit report. The General Contractor shall include in his response the following information.

1. Date of site visit by the Engineer,
2. Date of receipt of the site visit report,
3. Name and title of the preparer of the response,
4. An item number referenced to the site report,
5. A brief three or four word description of the item,
6. The Contractor or Subcontractor affected,
7. The proposed course of action, and
8. An expected time of completion of the action.

1.19 CUTTING AND PATCHING:

- A. No joists, beams, girders, columns, slabs, or other structural elements shall be cut, drilled, or altered in any way by the Contractor without first obtaining written permission and instructions from the Engineer and Architect.



- B. Where it is necessary to cut through any non-structural elements of walls, floors, or ceilings to permit the installation of any work under this contract, or to repair any defects that may appear up to expiration of the guarantee, such cutting shall be done by the Contractor with as little damage as reasonably possible to the element being cut or to adjacent elements.
- C. After the necessary work has been completed, the damage shall be repaired by the respective Contractor, who shall pay all costs of such cutting, repairs and patching. All patching or sealing of cuts and penetrations, including final appearance of same, shall be done to the approval of the Engineer and Architect.

1.20 INSURANCE:

- A. The Contractor shall have required insurance. Required insurance shall be provided by this Contractor for protection against public liability and property damage for the duration of work.

1.21 CONFLICTS AND CORRECTION OF WORK:

- A. Promptly correct work rejected or failing to conform to the requirements of the Contract, whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear cost of correcting such rejected and nonconforming work including additional testing and inspections and including compensation for observing mechanical and electrical engineering firm's services and expenses made necessary thereby.
- B. If a conflict occurs on the bid documents, the Contractor shall contact the Architect's and Engineer's offices with a written request for clarification. If the conflict is un-resolvable at the time of bid, the most expensive interpretation of the conflict shall be bid so the conflict can be resolved in a deductive manner at a later time if necessary.
- C. If a conflict is discovered during construction, the Contractor shall stop work and that portion of the project and contact the appropriate party for clarification. The request for clarification shall be in written form. The Contractor shall bare the burden of replacing work that has been installed incorrectly as a result of a conflict on the drawings where he has not sought the Architect's and/or Engineer's guidance for clarification.

1.22 COMMISSIONING:

- A. Coordinate all work with the commissioning agent and the commissioning specifications.

1.23 COORDINATION:



- A. In a timely manner, and coordinated with all work involved, prepare and submit a trade composite work plan to be integrated into the Commissioning Plan for the following areas:
 - 1. Where new work of three or more trades or subcontractors is installed.
 - 2. Where lead times are critical to the project schedule.
 - 3. Provide construction grade drawing as needed to acquire approval of work plan.
 - 4. Access or service spaces required for Electrical equipment.

- B. Provide final coordination plan to be integrated into the Commissioning Plan to account for:
 - 1. Matching the work to the final selection of equipment; incorporating manufacturer's published instructions into the design;
 - 2. Changes in equipment arrangement, and associated changes in equipment piping, ducting, and electrical work different from what is shown or specified;
 - 3. Changes by manufacturer between date of design and date of delivery of equipment;
 - 4. Relocations resulting from more than one trade being shown or specified in these drawings and specifications in the same location;
 - 5. Addition of minor structural, mechanical, and electrical work for a complete system;
 - 6. And similar circumstances as described above;
 - 7. Work shall not be installed prior to written reply acknowledging that coordination drawing submittals have accomplished the specified intent of coordination. Relocations of work installed prior to coordination drawing acknowledgment, if subsequently required to avoid interference, shall be made.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT:

- A. General: Refer to Division 1 sections for general requirements on products, materials and equipment. The following provisions expand or modify the requirements as applicable to electrical work:

- B. Materials List: Within 15 days after award of contract, the Electrical Subcontractor shall submit to the Engineer a list, seven (7) copies, of all equipment, fixtures, materials, etc. to be furnished. Where such equipment will be furnished "as specified", a listing of the specific equipment



manufacturer to be used on this project is sufficient. Where substitutions are proposed, complete data must be furnished showing performance, quality and dimensions. Written approval of the Engineer must be obtained before purchasing any substitute equipment.

- C. All materials shall be new and shall bear the label of the Underwriter's Laboratories, Inc., or be listed under reexamination service. All materials shall be of the best grade and latest pattern of manufacturer as specified.
- D. All work shall be performed in a neat, workmanlike manner and shall present a neat electrical appearance when completed.
 - E. All similar materials and equipment shall be the product of the same manufacturer.
- F. Where no specific material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be used, providing it conforms to the contract requirements and meets the approval of the Engineer.
- G. Materials and equipment shall be the standard products of manufacturers regularly engaged in the production of such material and shall be the manufacturer's current and standard design.
- H. Altitude: Equipment affected by altitude shall perform satisfactorily for the function intended at the altitude of the project site.
- I. Compatibility: Provide products, which are compatible with other products of the electrical work and with other work requiring interface with the electrical work, including electrical connections and control devices. For exposed electrical work, coordinate colors and finishes with other work.
- J. Substitution: Manufacturer's catalog numbers are specified for the purpose of establishing a standard. All proposed substitutions on specific materials (lighting fixtures but not limited to) shall be submitted in duplicate ten (10) days prior to bid openings. This request shall be accompanied by complete descriptions of the substitutes offered, including catalog cut sheets, performance, quality and dimensions. The entire burden of proof of equality shall be placed on the Electrical Subcontractor and the decision of the Engineer shall be final. All other electrical equipment, devices, etc. may have substitutions only if equal in quality and function to, or better than, the specified item. Complete descriptive and technical data shall be submitted on all proposed substitute items, together with the same data on the specified items. Material samples of the proposed substitute item, together with samples of the specified items, shall be submitted for comparison and test when requested by the Engineer.



- K. Work Quality: Fabrication, erection and installation of the complete electrical system shall be done in a first class workmanlike manner by qualified personnel experienced in such work and shall proceed in an orderly manner so as not to hold up the progress of the project. The Electrical Subcontractor shall check all areas and surfaces where electrical equipment material is to be installed, removed or relocated and report any unsatisfactory conditions to the Engineer before starting work. Commencement of work signifies this Electrical Subcontractor's acceptance of existing conditions. In the acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of the workmen.

2.2 ELECTRICAL EQUIPMENT AND WIRING FOR ARCHITECTURAL AND MECHANICAL DIVISION:

- A. Responsibility
 - 1. Unless otherwise indicated, all motors, conduit, wiring, and controls (including temperature) shall be furnished, set in place, and wired in accordance with the following schedule. (MD is Mechanical Division AD is Architectural Division, and ED is Electrical Division).

MECHANICAL-ELECTRICAL ARCHITECTURAL COORDINATION



TABLE 1			
	FURNISHED	SET IN PLACE OR MOUNTED UNDER	WIRED AND CONNECTED UNDER
1. Equipment Motors and Thermal	MD	MD	ED
2. Motor Controllers: magnetic starters, reduced voltage starters and overload relays.	MD (1)	ED (1)	ED
3. Disconnect switches, fused or unfused, HP rated switches, variable frequency drive controllers, thermal overload switches and fuses, manual operating switches.	ED (1)	ED (1)	ED
4. Pushbutton stations, pilot lights, multi-speed switches, variable speed switches, float switches, thermostats, control relays, time clocks, control transformer, control panels, motor valves, damper motors, solenoid valves, EP and PE switches and interlocks.	MD	MD (2)	MD (2)
5. Contactors, 120V control circuit outlets for control panels and for boiler controls and fire protection control and	ED	ED	ED
6. Fire Sprinkler System Control – Supervisory Panels and devices, including tamper switches and flow switches.	MD	MD(3)	ED
7. Plumbing Fixture Electrical Power: electric or gas water heaters, instantaneous water heater, electronic sensor systems, and circulation pumps.	MD	ED(1 & 3)	ED(3)
8. Architectural Equipment as listed in Divisions 2 through 14 such as elevator, ADA door openers, projections screen, etc.	AD (5)	MD (4 & 5)	ED (4 & 5)
9. Hospital and Medical Equipment:	MD	MD	ED(3)



Notes:

1. If furnished as part of factory wired equipment, wiring, conduit, and connection only be ED.
2. If float switches, line voltage thermostats, PE switches, time switches etc., carry the FULL LOAD CURRENT of any motor, they shall be furnished by the Mechanical Division, but shall be set in place, wired and connected by the Electrical Division, except that where such items are and integral part of the mechanical equipment, or directly attached to ducts, piping, etc., they shall be set in place under the Mechanical Division and wired and connected by the Electrical Division. If they do not carry the FULL LOAD CURRENT to any motor they shall be furnished, set in place and wired under the Mechanical Division.
3. Wiring and conduit from alarm contacts to alarm system and conduit for control functions by ED; all control function wiring by MD.
4. Wiring and conduit from alarm contacts and kitchen equipment shutdown to kitchen fire suppression system by ED; all control functions by MD.
5. Architectural division to set in place, Mechanical Contractor to make mechanical connections and Electrical Contractor to make electrical connections.
 - B. Connections:
 - C. 1. Connection to all control directly attached to ducts, piping and mechanical equipment shall be made with flexible connections not to exceed 3 linear feet.
 - D.
 - E. 2.3. PROTECTION OF PENETRATION:
 - F.
 - G. A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.
 - H.
 - I. B. Contractor shall verify locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.
 - J.
 - K. PART 3 – EXECUTION
 - L.
 - M. 3.1 GENERAL REQUIREMENTS:
 - N.
 - O. A. Comply with manufacturer's recommended installation procedures for electrical equipment. Refer to specific Division 26 specification sections for specific equipment installation requirements.
 - P.
 - Q. 3.2 ELECTRICAL INSTALLATION:



R.

S. A. Install all work to permit removal (without damage to other parts) of breakers and all other parts, which might require periodic replacement or maintenance. Arrange conduit and equipment to permit ready access to panels and to clear opens of doors and of access panels.

T.

B. Electrical Contractor shall coordinate with other trade with regards to equipment going under mechanical equipment. C. Electrical Contractor shall install electrical equipment in a manner to provide the manufacturer's recommended service clearance and access space. The Electrical Contractor shall be responsible for maintaining these clearances, coordinating them with the other trades and have installed work modified to maintain these clearances at no additional charge to the project or the Owner.

3.3 PROTECTION OF PENETRATION:

A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.

B. Contractor shall verify locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

3.4 ELECTRICAL WORK CLOSEOUT:

A. General: Refer to the Division 1 sections for general closeout requirements. Upon completion of the work, the various systems operated under load conditions shall be tested for short circuits and grounds in accordance with the method and resistance values outlined in the National Electrical Code and for load balance on feeders and branch circuits.

B. The complete system shall operate satisfactorily in every respect. Make any repairs or adjustments necessary to this end to the satisfaction of the Engineer.

C. Furnish all instruments and labor for testing.

3.5 GUARANTEE:



- A. The work to be performed shall be guaranteed for a period of one year after final acceptance against faulty workmanship and/or materials, and any failure or trouble due to such causes within the period of guarantee shall be made good upon demand of the Owner and without cost to the Owner.

3.6 MISCELLANEOUS ITEMS:

- A. Miscellaneous items not covered in these specifications shall be as indicated on the drawings, installed and connected by the proper method and as recommended by the manufacturer.
- B. Coordinate the thickness of the wall to accommodate the concealed conduits and its associated hangers, if required. I.E. 4-inch conduit requires a 6-inch thick wall.

3.7 PRODUCT HANDLING:

- A. Use all means necessary to protect electrical materials and equipment before, during and after installation and to protect the installed work of other trades. In the event of
 - U. damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no extra cost to him.
 - V.
 - W. 3.8 AS-BUILT DRAWINGS:
 - X.
 - Y. A. During progress of the Work, maintain an accurate record of the installation of the system. Upon completion of the installation, transfer all record data to blue line prints of the original drawings and furnish to the Engineer.

END OF SECTION 26 05 00

SECTION 26 05 19 – BUILDING WIRE AND CABLE PART 1 – GENERAL



Z. 1.1 SUMMARY:

AA.

BB. A. Section includes building wire and cable and wiring connectors and connections.

CC.

DD.1.2 REFERENCES:

EE. A. NECA (National Electrical Contractors Association) – Standard of Installation. B.

NETA ATS (International Electrical Testing Association) – Acceptance Testing

FF. Specifications for Electrical Power Distribution Equipment and Systems.

GG.

HH.1.3 WIRING METHODS AND PRODUCTS REQUIREMENTS:

II.

JJ. A. Product Requirements: Use products as indicated and as follows:

KK.

LL. 1. Use solid conductor for feeders and branch circuits 12 AWG and smaller.

MM. 2. Use conductor not smaller than 12 AWG for power and lighting circuits.

NN.3. Use conductors for 80% of branch circuit's circuit breaker size to provide no more than 3% voltage drop on branch circuits and no more than 5% voltage drop total from service entrance point to the load.

OO.

PP. B. Wiring Methods: Use wiring methods indicated and as follows:

QQ.

RR. 1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN, in raceway.

SS. 2. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN

TT. insulation in raceway.

UU. 3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN insulation in raceway.

VV.

WW. 1.4 FIELD MEASUREMENTS:

XX.

YY. A. Verify field measurements are as indicated.

ZZ.

AAA. 1.5 COORDINATION:

BBB.

CCC. A. Section 01 30 00 – Administrative Requirements: Coordination and project

conditions. PART 2 – PRODUCTS

DDD. 2.1 BUILDING

WIRE: A.

Manufacturers:



- EEE. 1. Houston Wire and Cable.
- FFF.2. Southwire.
- GGG. 3. Substitutions: Section 01 60 00 – Product Requirements – Permitted.

B. Product Description: Single conductor insulated wire. C.

Conductor: Copper.

D. Insulation Voltage Rating: 600 volts.

E. Insulation: Thermoplastic material rated 75 degrees C.

2.2 WIRING CONNECTORS: A. Split Bolt

Connectors:

- 1. IlSCO.
- 2. Substitutions: Section 01 60 00 – Product Requirements – Permitted.

B. Solderless Pressure Connectors:

- 1. IlSCO.
- 2. Substitutions: Section 01 60 00 – Product Requirements – Permitted.

C. Spring Wire Connectors:

- 1. IlSCO.
- 2. Substitutions: Section 01 60 00 – Product Requirements – Permitted. D.Compression

Connectors:

- 1. IlSCO.
- 2. Substitutions: Section 01 60 00 – Product Requirements – Permitted. PART 3 –

EXECUTION



3.1 EXAMINATION:

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions. B. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 EXISTING WORK:

- A. Remove exposed abandoned wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.
- B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes if wire and cable servicing them is abandoned and removed. Provide blank cover for abandoned boxes, which are not removed.
- C. Ensure access to existing wiring connections which remain active and which require access. Modify installation or provide access panel as appropriate. D. Extend existing circuits using materials and methods compatible with existing electrical installations or as specified.

3.3 INSTALLATION:

- A. Route wire and cable as required meeting Project conditions.
- B. Install wire and cable in accordance with the NECA "Standard of Installation." C. Neatly train and lace wiring inside boxes, equipment and panelboards.

3.4 FIELD QUALITY CONTROL:

- A. Section 01 40 00 – Quality Requirements: Testing and inspection services. B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspection and tests listed in NEAT ATS, Section 7.3.1

END OF SECTION 26 05 19

SECTION 26 05 26 – GROUNDING AND BONDING PART 1 – GENERAL

1.1 SECTION INCLUDES:



- A. Equipment grounding conductors. B.

Bonding.

1.2 REFERENCES:

- A. Section 01 45 00 – Quality Control: Requirements for references and standards.
- B. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).
- C. NFPA 70 – National Electrical Code.

1.3 REGULATORY REQUIREMENTS:

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.
- C. Conforms to requirements of NFPA 99. PART 2 –

PRODUCTS

2.1 EQUIPMENT GROUNDING CONDUCTOR: A. Material:

Stranded copper.

- B. Size to meet NFPA 70 requirements. PART 3 –

EXECUTION

3.1 EXAMINATION:

- A. Section 01 31 00 – Coordination and Meetings: Verification of existing conditions prior to beginning work.



3.2 INSTALLATION:

- A. Section 01 45 00 – Quality Control: Manufacturer's instructions. B. Provide bonding to meet Regulatory Requirements.
- C. Bond together each metallic raceway, pipe, duct and other metal objects. D. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.3 FIELD QUALITY CONTROL:

- A. Section 0 140 00 – Quality Assurance: Field inspection, testing and adjusting. B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.

END OF SECTION 26 05 26

SECTION 26 05 29 – SUPPORTING DEVICES PART 1 – GENERAL

1.1 SECTION INCLUDES:



- A. Conduit and equipment supports. B.
Anchors and fasteners.

1.2 REFERENCES:

- A. Section 01 45 00 – Quality Control: Requirements for references and standards. B. NECA
Standard of Installation (National Electrical Contractors Association).
- C. NFPA 70 – National Electrical Code.

1.3 SUBMITTALS FOR REVIEW:

- A. Section 01 33 00 – Submittals: Procedures for submittals.
- B. Product Data: Provide manufacturers catalog data for fastening systems.

1.4 REGULATORY REQUIREMENTS:

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 – PRODUCTS

2.1 PRODUCT REQUIREMENTS:

- A. Materials and Finishes: Corrosion resistant.
- B. Select materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit, including weight of wire in conduit.
- C. Anchors and Fasteners:



1. Concrete Structural Elements: Use pre-cast inserts, expansion anchors and preset inserts.
2. Steel Structural Elements: Use beam clamps and welded fasteners.
3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts.
5. Solid Masonry Walls: Use expansion anchors.
6. Sheet Metal: Use sheet metal screws.

2.2 FORMED STEEL CHANNEL:

3. A. Manufacturers:

4.

5. 1. B-line.

6. 2. Unistrut.

7. 3. Substitutions: Refer to Section 26 05 00 – Material and Equipment.

8.

9. B. Description: Galvanized or Painted steel.

PART 3 – EXECUTION

10. 3.1 INSTALLATION:

11.

12. A. Locate and install anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

13.

14.1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

15.2. Do not drill or cut structural members.

16.

17. B. Fabricate supports from structural steel or formed steel members. Rigidly weld members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

18.

19. C. Install surface-mounted cabinets and panelboards with minimum of four anchors.

20.

21. D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch (25 mm) off wall.

22.

23. E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

24.



END OF SECTION 26 05 29

SECTION 26 05 33 – CONDUIT PART 1 – GENERAL

- 1.1 SECTION INCLUDES: A. Metal conduit.
B. Flexible metal conduit.



- C. Liquid tight flexible metal conduit. D. Electrical metallic tubing.
- E. Nonmetal conduit.

- F. Fittings and conduit bodies.

1.2 RELATED SECTIONS:

- A. Section 07 84 00 - Fire Stopping. B. Section 26 05 34 - Boxes.
- C. Section 26 05 26 - Grounding and Bonding. D. Section 26 05 29 - Supporting Devices.
- E. Section 26 05 53 - Electrical Identification.

1.3 REFERENCES:

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- D. ANSI/NFPA 70 - National Electrical Code. E. NECA "Standard of Installation."
- F. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
- G. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80). H. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.4 DESIGN REQUIREMENTS:

- A. Conduit Size: ANSI/NFPA 70.

1.5 SUBMITTALS:



- A. Submit under provisions of Section 01 33 00.
 - B. Product Data: Provide for metallic conduit, flexible metal conduit, liquid tight flexible metal conduit, metallic tubing, nonmetallic conduit and conduit bodies.
- 1.6 PROJECT RECORD DOCUMENTS:
- A. Submit under provisions of Section 01 70 00.
- 1.7 REGULATORY REQUIREMENTS:
- A. Conform to requirements of ANSI/NFPA 70.
 - B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- 1.8 DELIVERY, STORAGE, AND HANDLING:
- A. Deliver, store, protect, and handle Products to site under provisions of Section 26 05 00.
 - B. Accept conduit on site. Inspect for damage.
 - C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
 - D. Protect PVC conduit from sunlight.
- 1.9 PROJECT CONDITIONS:
- A. Verify that field measurements are as shown on Drawings.



- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned.
Route as required to complete wiring system.

PART 2 – PRODUCTS

2.1 CONDUIT REQUIREMENTS:

- A. Minimum Size: 3/4 inch unless otherwise specified. B. Underground Installations:
 - 1. More than Five Feet from Foundation Wall: use rigid steel conduit or plastic coated conduit.
 - 2. Within Five Feet from Foundation Wall: Use rigid steel conduit.
 - 3. In or Under Slab on Grade: Use rigid steel conduit or plastic coated conduit.
 - 4. Minimum Size: 3/4 inch.
- C. Outdoor Locations, Above Grade: Use rigid steel conduit. D. In Slab Above Grade:
 - 1. Use rigid steel conduit or thickwall nonmetallic conduit.
 - 2. Maximum Size Conduit in Slab: 1/2 inch.
- E. Wet and Damp Locations: Use rigid steel conduit. F. Dry Locations:
 - 1. Concealed: Use rigid steel conduit and electrical metallic tubing.
 - 2. Exposed: Use rigid steel conduit and electrical metallic tubing.

2.2 METAL CONDUIT: A.

Manufacturers:

- 1. Allied.
- 2. Substitutions: Under provisions of Section 26 05 00.

- B. Rigid Steel Conduit: ANSI C80.1.



- C. Intermediate Metal Conduit (IMC): Rigid steel.
- D. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

2.3 FLEXIBLE METAL CONDUIT: A. Manufacturers:

- 1. Alflex.
- 2. Greenfield.
- 3. Substitutions: Under provisions of Section 26 05 00.

- B. Description: Interlocked steel construction. C. Fittings: ANSI/NEMA FB 1.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT: A. Manufacturers:

- 1. Ultratight.
- 2. Substitutions: Under provisions of Section 26 05 00. B. Description: Interlocked steel construction with PVC jacket. C. Fittings: ANSI/NEMA FB 1.

2.5 ELECTRICAL METALLIC TUBING (EMT): A. Manufacturers:

- 1. Allied.
- 2. Substitutions: Under provisions of Section 26 05 00.
- B. Description: ANSI C80.3; galvanized tubing.
- C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel, compression type.

2.6 NONMETALLIC CONDUIT: A.

Manufacturers:

- 1. Carlon.
- 2. Cantex.
- 3. Substitutions: Under provisions of Section 26 05 00.

- B. Description: NEMA TC 2; Schedule 40 and 80 PVC. C. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 – EXECUTION



3.1 INSTALLATION:

- A. Install conduit in accordance with NECA "Standard of Installation."
- B. Install nonmetallic conduit in accordance with manufacturer's instructions. C. Arrange supports to prevent misalignment during wiring installation.
- D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- E. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- F. Fasten conduit supports to building structure and surfaces under provisions of Division 26.
- G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- H. Do not attach conduit to ceiling support wires. I. Arrange conduit to maintain headroom and present neat appearance. J. Route exposed conduit parallel and perpendicular to walls.
- K. Route conduit installed above accessible ceilings parallel and perpendicular to walls. L. Route conduit in and under slab from point-to-point.
- M. Do not cross conduits in slab.
- N. Maintain adequate clearance between conduit and piping.
- O. Maintain 12-inch (300 mm) clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).
- P. Cut conduit square using saw or pipe-cutter; de-burr cut ends. Q. Bring conduit to shoulder of fittings; fasten securely.
- R. Join nonmetallic conduit using cement as 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.



- S. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- T. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2-inch (50 mm) size.
- U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints.
- W. Provide suitable pull string in each empty conduit except sleeves and nipples.
- X. Use suitable caps to protect installed conduit against entrance of dirt and moisture. Y. Ground and bond conduit under provisions of Section 26 05 26.
- Z. Identify conduit under provisions of Section 26 05 53.

3.2 INTERFACE WITH OTHER PRODUCTS:

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Section 07 27 00. B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket.

END OF SECTION 26 05 33

SECTION 26 05 34 – BOXES PART 1 – GENERAL

1.1 SECTION INCLUDES:



- A. Wall and ceiling outlet boxes. B. Pull and junction boxes.

1.2 RELATED SECTIONS:

- A. Section 07 84 00 - Firestopping. B. Section 08 31 13 - Access Doors.
- C. Section 26 27 26 - Wiring Devices: Wall plates in finished areas.

1.3 REFERENCES:

- A. NECA – Standard of Installation.
- B. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- C. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports. D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. NFPA 70 – National Electrical Code.

1.4 SUBMITTALS FOR CLOSEOUT:

- A. Section 01 70 00 – Contract Closeout: Submittals for Project closeout.
- B. Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Provide Products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 – PRODUCTS



2.1 OUTLET BOXES:

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel. 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch (13 mm) male fixture studs where required.
- 2. Concrete Ceiling Boxes: Concrete type.
- B. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.
- C. Wall Plates for Finished Areas: As specified in Division 26.

2.2 PULL AND JUNCTION BOXES:

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel. B. Hinged Enclosures: As specified in Division 26.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
 - 1. Material: Galvanized cast iron.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- D. In-Ground Cast Metal Box: NEMA 250, Type 6, inside flanged, recessed cover box for flush mounting:
 - 1. Material: Galvanized cast iron.
 - 2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
 - 3. Cover Legend: "ELECTRIC".

PART 3 – EXECUTION

3.1 EXAMINATION:

- A. Verify locations of outlets in offices and work areas prior to rough-in.



3.2 INSTALLATION:

- A. Install boxes in accordance with NECA "Standard of Installation."
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- C. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
Adjust box location up to 10 feet if required to accommodate intended purpose.
- E. Orient boxes to accommodate wiring devices oriented as specified in Division 26. F. Maintain headroom and present neat mechanical appearance.
- G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- H. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire.
- I. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 27 00.
- J. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- K. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- L. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- M. Use flush mounting outlet box in finished areas.
- N. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- O. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches (150 mm) separation. Provide minimum 24 inches (600 mm) separation in acoustic rated walls.
- P. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.



- Q. Use stamped steel bridges to fasten flush mounting outlet box between studs.
 - R. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
 - S. Use adjustable steel channel fasteners for hung ceiling outlet box. T. Do not fasten boxes to ceiling support wires.
 - U. Support boxes independently of conduit.
 - V. Use gang box where more than one device is mounted together. Do not use sectional box.
 - W. Use gang box with plaster ring for single device outlets.
 - X. Use cast outlet box in exterior locations [exposed to the weather] and wet locations.
 - Y. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations. Z. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.
- 3.3 INTERFACE WITH OTHER PRODUCTS:
- A. Coordinate installation of outlet box for equipment connected under Division 26.
- 3.4 ADJUSTING:
- A. Section 01 77 19 – Contract Closeout: Adjusting installed work.
 - B. Adjust flush-mounting outlets to make front flush with finished wall material. C. Install knockout closures in unused box openings.
- 3.5 CLEANING:
- A. Section 01 74 23 – Contract Closeout: Cleaning installed work.
 - B. Clean interior of boxes to remove dust, debris, and other material. C. Clean exposed surfaces and restore finish.
- END OF SECTION 26 05 34

SECTION 26 05 53 – ELECTRICAL IDENTIFICATION PART 1 – GENERAL



1.1 SECTION INCLUDES: A. Nameplates and labels. B. Wire and cable markers. C. Conduit markers.

1.2 RELATED SECTIONS:

A. Section 09 91 00 – Painting.

1.3 REFERENCES:

A. Section 01 45 00 – Quality Control: Requirements for references and standards. B. NFPA 70 – National Electrical Code.

1.4 SUBMITTALS FOR REVIEW:

A. Section 01 33 00 – Submittals: Procedures for submittals.

B. Product Data: Provide catalog data for nameplates, labels, and markers.

1.5 REGULATORY REQUIREMENTS:

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 – PRODUCTS

2.1 NAMEPLATES AND LABELS:

A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.

1. Each electrical distribution and control equipment enclosure.
2. Communication cabinets.



- C. Letter Size:
 - 1. 1/8-inch letters for identifying individual equipment and loads.
 - 2. 1/4-inch letters for identifying grouped equipment and loads.
- D. Labels: Embossed adhesive tape, with 3/16-inch white letters on black background. Use only for identification of individual wall switches and receptacles and control device stations.
 - 2.2 WIRE MARKERS: A. Manufacturers:
 - 1. Brady.
 - 2. Panduit.
 - 3. Substitutions: Refer to Section 26 05 00 – Material and Equipment.
 - 2.3 UNDERGROUND WARNING TAPE:
 - A. Description: 4-inch wide plastic tape, colored red with suitable warning legend describing buried electrical lines.
 - B. Location: Along length of each underground conduit. PART 3 – EXECUTION
 - 3.1 PREPARATION:
 - A. Degrease and clean surfaces to receive nameplates and labels.
 - 3.2 INSTALLATION:
 - A. Section 01 45 00 – Quality Control: Manufacturer's instructions. B. Install nameplate and label parallel to equipment lines.
 - C. Secure nameplate to equipment front using rivets.
 - D. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
 - E. Identify underground conduits using one underground warning tape per trench at 3 inches (75 mm) below finished grade.

END OF SECTION 26 05 53

SECTION 26 05 63 – EQUIPMENT WIRING SYSTEMS PART 1 – GENERAL



1.1 SECTION INCLUDES:

- A. Electrical connections to equipment specified under other sections.

1.2 RELATED SECTIONS:

- A. Section 01 11 00 - Summary of Work: Owner-furnished equipment. B. Section 22 30 00 - Plumbing Equipment.
- C. Section 26 05 33 - Conduit.
- D. Section 26 05 19 - Building Wire and Cable. E. Section 26 05 34 - Boxes.

1.3 REFERENCES:

- A. NEMA WD 1 - General Purpose Wiring Devices. B. NEMA WD 6 - Wiring Device Configurations.
- C. ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS:

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 REGULATORY REQUIREMENTS:

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

1.6 COORDINATION:

- A. Coordinate work under provisions of Section 01 31 00.
- B. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections.
- C. Determine connection locations and requirements.
- D. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.



E. Sequence electrical connections to coordinate with start-up schedule for equipment. PART 2 – PRODUCTS

2.1 CORDS AND CAPS:

- A. Attachment Plug Construction: Conform to NEMA WD 1.
- B. Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
- C. Cord Construction: ANSI/NFPA 70, Type SO or SJO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- D. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit over current protection.

PART 3 – EXECUTION

3.1 EXAMINATION:

- A. Verify conditions under provisions of Section 01 03 90.
- B. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS:

- A. Make electrical connections in accordance with equipment manufacturer's instructions. B. Make conduit connections to equipment using flexible conduit. Use liquid tight flexible conduit with watertight connectors in damp or wet locations.
- C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.
- D. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- E. Install disconnect switches, controllers, control stations, and control devices as indicated.
- F. Modify equipment control wiring with terminal block jumpers as indicated.
- G. Provide interconnecting conduit and wiring between devices and equipment where indicated.
- H. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION 26 05 63

SECTION 26 24 16 – PANELBOARDS PART 1 – GENERAL

1.1 SECTION INCLUDES:



- A. Distribution panelboards.
- B. Branch circuit panelboards.
- 1.2 RELATED SECTIONS:
 - A. Section 26 05 26 – Grounding and Bonding. B. Section 26 05 53 – Electrical Identification.
- 1.3 REFERENCES:
 - A. NECA Standard of Installation (published by the National Electrical Contractors Association).
 - B. NEMA AB1 - Molded Case Circuit Breakers.
 - C. NEMA ICS 2 – Industrial Control Devices, Controllers and Assemblies.
 - D. NEMA KS1 – Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
 - E. NEMA PB 1 – Panelboards.
 - F. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
 - G. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment (published by the International Electrical Testing Association).
 - H. NFPA 70 – National Electrical Code.
- 1.4 SUBMITTALS FOR REVIEW:
 - A. Section 01 33 00 – Submittals: Procedures for submittals.
 - B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes. Indicate service maintenance and access clearances.
- 1.5 SUBMITTALS FOR CLOSEOUT:
 - A. Section 01 70 00 – Contract Closeout: Submittals for project closeout.
 - B. Record actual locations of panelboards and record actual circuiting arrangements in project record documents.



- C. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.6 QUALIFICATIONS:

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS:

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.8 MAINTENANCE MATERIALS:

- A. Section 01 70 00 – Contract Closeout. B. Furnish two of each panelboard key.

PART 2 – PRODUCTS

2.1 DISTRIBUTION PANELBOARDS:

- A. Section 01 60 00 – Material and Equipment: Product Options and Substitutions. B. Manufacturers:
 - 1. Square-D by Schneider.
 - 2. Westinghouse.
 - 3. General Electric.
 - 4. Substitutions: Permitted.
- C. Description: NEMA PB 1, circuit breaker type.
- D. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.
- E. Minimum integrated short circuit rating: 10,000 amperes rms symmetrical for 240 volt panelboards, or as indicated.
- F. Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits. G. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.



- H. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated. I.
Enclosure: NEMA PB 1, Type 1.
- J. Cabinet Front: Surface type, fastened with concealed screws, hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

2.2 BRANCH CIRCUIT PANELBOARDS:

- A. Section 01 60 00 – Material and Equipment: Product Options and Substitutions. B.
Manufacturers:
 - 1. Square-D by Schneider.
 - 2. General Electric.
 - 3. Westinghouse.
 - 4. Substitutions: Permitted.
- C. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
- D. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard; provide insulated ground bus where scheduled.
- E. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical for 240 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards, or as indicated.
- F. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.
- G. Enclosure: NEMA PB 1, Type 1.
- H. Cabinet Box: 6 inches deep, 20 inches wide.
- I. Cabinet Front: Flush cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

PART 3 – EXECUTION



3.1 INSTALLATION: A. Install panelboards in accordance with NEMA PB 1.1 and the NECA "Standard of

Installation."

- B. Install equipment with and maintain all service clearances as required by code and/or recommended by the manufacturer.
- C. Install panelboards plumb.
- D. Height: 6 feet (1800 mm) to top of panelboard; install panelboards taller than 6 feet (1800 mm) with bottom no more than 4 inches (100 mm) above floor.
- E. Provide filler plates for unused spaces in panelboards.
- F. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- G. Provide engraved plastic nameplates under the provisions of Section 26 05 53. H. Ground and bond panelboard enclosure according to Section 26 05 26.

3.2 FIELD QUALITY CONTROL:

- A. Section 01 45 00 – Quality Control: Field inspection, testing and adjusting. B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.4 for switches, and Section 7.5 for circuit breakers.

3.3 ADJUSTING:

- A. Section 01 70 00 – Contract Closeout: Adjusting installed work.
- B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION 26 24 16

SECTION 26 27 26 – WIRING DEVICES PART 1 – GENERAL

1.1 SUMMARY:



A. Related Sections:

1. Section 26 05 34 – Boxes: Outlet boxes for wiring devices.

1.2 REFERENCES:

- A. NECA (National Contractors Association) – Standard of Installation.
- B. NEMA WD 1 (National Electrical Manufacturers Association) – General Requirements for Wiring Devices.
- C. NEMA WD 6 (National Electrical Manufacturers Association) – Wiring Device – Dimensional Requirements.

PART 2 – PRODUCTS

2.1 WALL SWITCHES, RECEPTACLES, AND WALL PLATES: A. Manufacturers:

1. Hubbell.
2. Pass and Seymour.

B. Ratings: Match branch circuit and load characteristics. PART 3 – EXECUTION

3.1 EXAMINATION:

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions. B. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify that branch circuit wiring installation is completed, tested and ready for connection to wiring devices.

3.2 PREPARATION: A. Clean debris from outlet boxes.

3.3 INSTALLATION:

- A. Install in accordance with NECA “Standard of Installation.”

3.4 ADJUSTING:

- A. Section 01 70 00 – Execution Requirements: Testing, Adjusting and Balancing. B. Adjust devices and wall plates to be flush and level.

3.5 CLEANING:

- A. Section 01 45 00 – Execution Requirements: Final Cleaning. B. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION 26 27 26

SECTION 26 27 29 – MODULAR WIRING SYSTEM PART 1 – GENERAL

1.1 CONDITIONS AND REQUIREMENTS:



- A. The General Conditions, Supplementary Conditions, and Division 01 – General Requirements apply.
- 1.2 SECTION INCLUDES:
- A. Modular wiring system consisting of factory-assembled connectors and cable sets designed to interface with various power applications including raised floor boxes, service poles, surface raceways, wireways, and convenience outlets.
- 1.3 RELATED SECTIONS:
- A. Section 07 84 13 – Penetration Firestopping Devices.
 - B. Division 26 – Electrical: Electrical systems and components.
- 1.4 SUBMITTALS:
- A. Submit under provisions of Section 01 33 00.
 - B. Product Data: Submit for modular wiring system components including:
 - 1. Distribution units.
 - 2. Cable whips.
 - 3. Cable sets.
 - 4. Power adapters.
 - 5. Cable splitters.
 - 6. Power taps.
 - 7. Wire connectors.
 - 8. Pre-wired raised floor boxes and covers.
 - 9. Poke-thru devices.
 - C. Shop Drawings: For modular wiring system components not adequately described by product data. Include plans, elevations, sections, details, and attachments to other work.
- 1.5 QUALITY ASSURANCE:
- A. Manufacturers: Firms regularly engaged in manufacture of modular wiring system components of the types and sizes required, whose products have been in satisfactory use in similar service for not less than 10 years. Provide modular wiring system components produced by a manufacturer listed in this section.
 - B. Source Limitations: Obtain each type of modular wiring system components through one (1) source from a single manufacturer.
 - D. Conform to requirements of NFPA 99.
- 1.7 EXTRA PRODUCTS:



A. Section 01 70 00 – Contract Closeout. PART 2 –
PRODUCTS

2.1 LUMINAIRES:

- A. Furnish Products as scheduled. Refer to Section 01 60 00 for substitutions and product options.

2.2. LAMPS:

- A. Light Emitting Diode (L.E.D.) Manufacturers:

1. Philips.
2. Sylvania.
3. Section 01 60 00 – Materials and Equipment: Product options and substitutions.

B. Lamp Types: As specified for luminaire. PART 3 –
EXECUTION

3.1 INSTALLATION:

- A. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- B. Support luminaires larger than 2 x 4 foot (600 x 1200 mm) size independent of ceiling framing.
- C. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- D. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- E. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips.
- F. Install recessed luminaires to permit removal from below.
- G. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.



- H. Install clips to secure recessed grid-supported luminaries in place. I. Install wall mounted luminaries at height as scheduled.
 - J. Install accessories furnished with each luminaire.
 - K. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
 - L. Bond products and metal accessories to branch circuit equipment grounding conductor.
 - M. Install specified lamps in each luminaire.
- 3.2 FIELD QUALITY CONTROL:
- A. Section 01 40 00 – Quality Assurance: Field inspection, testing and adjusting.
 - B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.
- 3.3 ADJUSTING:
- A. Section 01 70 00 – Contract Closeout: Adjusting installed work. B. Aim and adjust luminaries as indicated.
- 3.4 CLEANING:
- A. Section 01 70 00 – Contract Closeout: Cleaning installed work.
 - B. Clean electrical parts to remove conductive and deleterious materials. C. Remove dirt and debris from enclosures.
 - D. Clean photometric control surfaces as recommended by manufacturer. E. Clean finishes and touch up damage.
- 3.5 PROTECTION OF FINISHED WORK:
- A. Section 01 70 00 – Contract Closeout: Protecting installed work.
 - B. Re-lamp luminaries that have failed lamps at Substantial Completion.
 - C. END OF SECTION 26 51 00

SECTION 26 56 00 – EXTERIOR LUMINARIES PART 1 – GENERAL

- D. 1.1 SUMMARY:
- E.



F. A. Section includes exterior luminaries and accessories.

G.

H. 1.2 UNIT PRICE – MEASUREMENT AND PAYMENT: A.

Exterior Luminaire:

I. 1. Basis of Measurement: Each.

J. 2. Basis of Payment: Includes luminaire with lamps and accessories and connection to power source.

K.

L. 1.3 SUBMITTALS:

M.

N. A. Section 01 33 00 – Submittal Procedures: Submittal procedures.

O.

P. B. Shop Drawings: Indicate dimensions and components for each luminaire not standard

Q. Product of manufacturer.

R.

S. C. Product Data: Submit dimensions, ratings, and performance data.

T.

U. 1.4 QUALIFICATIONS:

V.

W. A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [documented] experience.

X.

Y. 1.5 DELIVERY, STORAGE, AND HANDLING:

Z.

AA.A. Section 01 60 00 – Product Requirements: Product storage and handling requirements.

BB.

CC. B. Store and handle solid wood poles in accordance with ANSI O5.1.

DD.

EE. 1.6 COORDINATION:

FF.

GG. A. Section 01 30 00 – Administrative Requirements: Coordination and project

conditions. B. Coordinate fixture location with landscaping.

HH. PART 2 – PRODUCTS

II.

JJ. 2.1 LUMINARIES:

KK.

A. Product Description: Complete exterior luminaire assemblies, with features, options, and accessories as scheduled. B. Refer to Section 01 60 00 – Product Requirements for product options. Substitutions are not permitted.



2.2 Light Emitting Diode (L.E.D.) LAMPS: A. Manufacturers:

1. CREE.
2. General Electric Co.
3. Philips Electronic North America.
4. Sylvania.

PART 3 – EXECUTION

3.1 EXAMINATION:

- A. Section 01 30 00 – Administrative Requirements and 26 05 00 – General Electrical Requirements: Coordination and Project conditions.
- B. Verify foundations are ready to receive fixtures.

3.2 EXISTING WORK:

- A. Disconnect and remove abandoned exterior luminaries.
- B. Extend existing exterior luminaire installations using materials and methods [compatible with existing installations, or] as specified.
- C. Clean and repair existing exterior luminaries to remain or to be reinstalled.

3.3 INSTALLATION:

- A. Install concrete bases for lighting poles at locations as indicated on Drawings, in accordance with Section 03 30 00.
- B. Install poles plumb. [Install [shims] [double nuts] to adjust plumb. Grout around each base.]
- C. Install lamps in each luminaire.
- D. Bond and ground luminaries in accordance with Section 26 05 26.

3.4 FIELD QUALITY CONTROL:

- A. Section 01 45 00 – Quality Requirements: Testing and Inspection Services and 26 05 00 – General Electrical Requirements: Testing, adjusting, and balancing.
- B. Operate each luminaire after installation and connection. Inspect for improper connections and operation.



- C. Measure illumination levels to verify conformance with performance requirements. D. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

3.5 ADJUSTING:

- A. Section 01 70 00 – Execution Requirements and 26 05 00 – General Electrical Requirements: Testing, adjusting, and balancing.
- B. Aim and adjust luminaries to provide illumination levels and distribution.

3.6 CLEANING:

- A. Section 01 70 00 – Execution Requirements and 26 05 00 – General Electrical Requirements: Final cleaning.
- B. Clean photometric control surfaces as recommended by manufacturer. C. Clean finishes and touch up damage.

3.7 PROTECTION OF FINISHED WORK:

- A. Section 01 70 00 – Execution Requirements: Protecting finished work. B. Relamp luminaries having failed lamps at Substantial Completion.

END OF SECTION 26 56 00



APPENDIX A- STRUCTURAL CALCULATIONS

STRUCTURAL DESIGN NARRATIVE

General Description

The structural design of the Adapt house was based on efficiency, adaptability, and construction practicality. The house consists of three main systems, the foundation, the main house structure, and an exterior canopy and deck.

Foundations

The most important aspect of the foundation system is its adjustable height. It will consist of two longitudinal W10x33 and four transverse W8x13 steel beams where the main structure will rest and connect to. Six adjustable interior piers will support each longitudinal beam 2 adjustable perimeter piers will support each transverse beam. Each pier has an adjustable height from 11 to 18 inches to accommodate for any change in slope at ground level. These piers will rest on a concrete footing, which will be braced to the ground with 2 40-inch long steel stakes to resist wind uplift, and seismic and wind generated overturning and sliding.

Superstructure

Most of the main house structure will be made of structural insulated panels (SIP) with a polyurethane core to provide high-efficiency insulation and a simple and speedy construction. The roof consists of 8 ¼-inch thick panels providing an R-value of 54 and the walls consist of 6 ½-inch panels with an R-value of 42. The walls will rest on a 2x10 timber frame sub-flooring system with polyurethane spray foam for insulation. To take the fullest advantage of the structural properties of these panels, the walls will serve as load-bearing walls as well as the lateral-force-resisting-system for wind and seismic loads.



Exterior Deck and Canopy

The exterior space of this home is made up of a floor deck with a partial canopy overhead. The deck material is made up of a high-performance wood-alternative composite material. The framing system for the deck will consist of 8 ¾-inch box beams serving as supporting girders for the joists spanning throughout the whole deck. Wooden 4x4 posts with an adjustable base will transfer the deck loads to the ground. Each post will be braced to the ground with 1-40-inch long steel stake to provide the same resistance as the house foundation system. The canopy will consist of HSS8x2x1/8 and HSS8X2X3/16 beams to support McNichols quality perforated 18-gauge plain steel and HSS4x4x1/4 supports.



TEAM TEXAS **ADAPT HOME**
THE UNIVERSITY OF TEXAS AT EL PASO & EL PASO COMMUNITY COLLEGE
PROFESSOR AUSTIN MARSHALL, J.D., P.E. ASMARSHALL@UTEP.EDU (915) 747-5765

APPENDIX B- ICC-ES EVALUATION



TEAM TEXAS **ADAPT HOME**
THE UNIVERSITY OF TEXAS AT EL PASO & EL PASO COMMUNITY COLLEGE
PROFESSOR AUSTIN MARSHALL, J.D., P.E. ASMARSHALL@UTEP.EDU (915) 747-5765

APPENDIX C- PRODUCT DATA

ELECTRICAL INFORMATION



TEAM TEXAS **ADAPT HOME**
THE UNIVERSITY OF TEXAS AT EL PASO & EL PASO COMMUNITY COLLEGE
PROFESSOR AUSTIN MARSHALL, J.D., P.E. ASMARSHALL@UTEP.EDU (915) 747-5765

MECHANICAL INFORMATION



TEAM TEXAS **ADAPT HOME**
THE UNIVERSITY OF TEXAS AT EL PASO & EL PASO COMMUNITY COLLEGE
PROFESSOR AUSTIN MARSHALL, J.D., P.E. ASMARSHALL@UTEP.EDU (915) 747-5765

PLUMBING INFORMATION



APPENDIX D- TRANSPORTATION INFO

ARRIVAL SEQUENCE PLAN (CONSTRUCTION)

PHASE 1

The lot is cleared and ready for construction. The crane shall set up on the east side of the lot 106 for Team Texas in the construction area.

PHASE 2

The 48 foot flatbed truck transporting the foundation components shall be escorted onto the lot. The crane will then unload foundation beam and anchor equipment. Beams and anchors shall be set accordingly to the site plan. Once unloaded the flatbed truck will then be escorted back onto the transportation lane for exit.

PHASE 3

The low boy truck transporting mechanical room module shall be escorted onto the lot from the transportation lane. The crane shall unload the module onto the foundation beams by coordination. Once unloaded, the module will need to be unwrapped before panels are connected. The low boy truck shall be escorted onto the transportation lane for exit.

PHASE 4

Flatbed trucks carrying the panels shall be escorted onto the lot. The crane shall then unload the panels by frame: floor, walls, roof, and the deck. These panels shall be connected to the module, foundation beams and any module it must fit to. Bracing may be needed when setting the walls before the roof. Once unloaded, the trucks will then exit via the transportation lane.

PHASE 5

The trucks holding the furniture and equipment will be escorted onto the lot. All furniture and equipment shall be unloaded by crane or crew depending on feasibility. Once unloaded, the trucks shall then be escorted back onto the transportation lane for exit.

PHASE 6

Taking care that space was made available, the crane shall unload from its stabilizers and be directed of the lot and onto the temporary loading zone for exit.



DEPARTURE SEQUENCE PLAN (DECONSTRUCTION)

PHASE 1

Site is cleared for deconstruction. The crane shall set up on the east side of the modular home on lot 106 for Team Texas.

PHASE 2

Trucks transporting the furniture and equipment shall be escorted onto the lot. Sidings are removed along with any landscape and loaded onto the trucks by crane or crew depending on the load. These trucks will then be escorted back onto the transportation lane.

PHASE 3

Walls and non-structural openings shall be properly braced before roof panels are disconnected. The mechanical room module is also braced.

PHASE 4

Flatbed trucks for transporting the panels are guided onto the loading lane. Roof panels are first loaded onto trucks by the crane. The wall panels are then unbraced then stacked onto the roof panels. The floor panels are then disconnected then stacked onto the wall panels. The deck panels are disconnected then stacked onto the floor panels. All panels are secured by the certified trucker onto the flatbeds. The flatbed trucks are then guided onto the transportation lane for exit.

PHASE 5

The module is then wrapped by the team and carefully disassembled from the foundational beams.

PHASE 6

The low boy truck transporting the module is then directed onto the loading lane. The crane shall load the module onto the low boy. The trucker will then properly strap the module. The truck shall be directed back onto the transportation lane for exit.