# Project Manual

**An Apartment Community**

# Ridge Estates of Jonesboro

Jonesboro, Arkansas

Owner:
Ridge Estates of Jonesboro, Limited Partnership
9800 Maumelle Blvd
North Little Rock, AR 72113

Architect:
The Design Group, Inc.
9802 Maumelle Blvd
North Little Rock AR 72113
501-753-5666

Civil Engineer:
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Structural Engineer:
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# July 25, 2016

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SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY OF WORK

Project: Ridge Estates of Jonesboro
North Patrick Street
Jonesboro, AR

A. Owner: Ridge Estates of Jonesboro, Limited Partnership
9800 Maumelle Blvd
North Little Rock, AR 72113

B. Architect: The Design Group, Inc.
9802 Maumelle Blvd
North Little Rock, AR 72113
PH: 501-753-5666
FX: 501-753-5661

C. The Work consists of construction of 31 new 3 Bedroom, 13 new 4 Bedroom & 1 Manager’s Facility building, totaling 44 units and one new clubhouse.

1.2 WORK RESTRICTIONS

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01100

Project Summary: Ridge Estates of Jonesboro

# Unit Summary

| Project | Manager/Community | 3 bedroom | 4 bedroom | Total units |
|---|---|---|---|---|
| Total | 1 | 31 | 14 | 46 |

# Unit Net Area

| Unit | Conditioned (Net Area) | Not conditioned | Balcony/Porch | Bedroom SQ FT | Total SQ FT (Gross) |
|---|---|---|---|---|---|
| 3 Bedroom | 1,259 sf | 407 sf | 72 sf | 137/149/152 | 1,738 |
| 4 Bedroom | 1,467 sf | 407 sf | 72 sf | 120/137/149/152 | 1,946 |
| 3 Bedroom/Managers | 1,471 sf | 440 sf | 102 sf | 145/145/175 | 2,013 |

# Total Gross Area

| Building | Total |
|---|---|
| 3 Bedroom | 53,878 sf |
| 4 Bedroom | 25,298 sf |
| Manager’s Apartment | 2,013 sf |
| Community Facilities | 1,236 sf |
| | 82,425 sf |

SECTION 01330 – SUBMITTAL REGISTER

| No. | Section | Description | Date Subm | Date Retn | Action |
|---|---|---|---|---|---|
| ~~03300~~ | ~~Concrete~~ | ~~Post tensioned concrete shop drawings~~ | | | |
| ~~03540~~ | ~~Gypsum Underlayment~~ | ~~Sound rated floor/ceiling assemblies.~~ | | | |
| 06176 | Trusses | Wood truss shop drawings. | | | |
| 05511 | Metal Stairs | Stair, handrail, and guardrail shop drawings | | | |
| ~~07210~~ | ~~Building Insulation~~ | ~~Wall and ceiling insulation.~~ | | | |
| ~~07311~~ | ~~Asphalt Shingles~~ | ~~Manufacturer's literature and warranty.~~ | | | |
| ~~07460~~ | ~~Siding~~ | ~~Manufacturer's literature and warranty~~ | | | |
| ~~08561~~ | ~~Vinyl Windows~~ | ~~Performance characteristics and warranty.~~ | | | |
| ~~08710~~ | ~~Door Hardware~~ | ~~Entrance locksets~~ | | | |
| ~~09250~~ | ~~Gypsum Board~~ | ~~Sound rated partitions.~~ | | | |
| ~~11451~~ | ~~Appliances~~ | ~~Manufacturer's literature and ratings~~ | | | |
| ~~12356~~ | ~~Casework~~ | ~~Shop drawings for accessible apartments.~~ | | | |
| 15410 | Plumbing Fixtures | Accessible plumbing fixtures | | | |
| 15500 | Fire Protection | Fire protection sprinkler shop drawings | | | |
| ~~15613~~ | ~~Air Handler~~ | ~~Manufacturer's literature w/ A/C units.~~ | | | |
| ~~15736~~ | ~~A/C Units~~ | ~~Manufacturer's literature w/ air handler..~~ | | | |

| No. | Section | Description | Date Subm | Date Retn | Action |
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END OF SECTION 01330

# SECTION 03300 - CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Ready-Mixed Concrete Producer Qualifications: ASTM C 94/C 94M.

B. Comply with ACI 301, "Specification for Structural Concrete"; ACI 117, "Specifications for Tolerances for Concrete Construction and Materials"; and CRSI's "Manual of Standard Practice."

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain Steel Wire: ASTM A 82, as drawn.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

E. Portland Cement: ASTM C 150, Type I or II.

F. Fly Ash: ASTM C 618, Type C or F.

G. Aggregates: ASTM C 33, uniformly graded.

H. Synthetic Fiber: ASTM C 1116, Type III, polypropylene fibers, 1/2 to 1-1/2 inches (13 to 38 mm) long.

I. Vapor Retarder: Clear 10-mil- (0.25-mm-) thick polyethylene sheet.

J. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

K. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

L. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

M. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

N. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.2 MIXES

A. Comply with ACI 301 requirements for concrete mixtures.

B. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:

1. Minimum Compressive Strength: 3500 psi (27.6 MPa) at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 5 inches (125 mm), plus or minus 1 inch (25 mm).
4. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of floor slabs to receive troweled finishes to exceed 3 percent.

C. Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M.

1. When air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 CONCRETING

A. Construct formwork according to ACI 301 and maintain tolerances and surface irregularities within ACI 347R limits of Class A, 1/8 inch (3.2 mm) for concrete exposed to view and Class C, 1/2 inch (13 mm) for other concrete surfaces.

B. Place vapor retarder on prepared subgrade, with joints lapped 6 inches (150 mm) and sealed.

C. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

D. Install construction, isolation, and contraction joints where indicated. Install full-depth joint-filler strips at isolation joints.

E. Place concrete in a continuous operation and consolidate using mechanical vibrating equipment.

F. Protect concrete from physical damage, premature drying, and reduced strength due to hot or cold weather during mixing, placing, and curing.

G. Formed Surface Finish: Smooth-formed finish for concrete exposed to view, coated, or covered by waterproofing or other direct-applied material; rough-formed finish elsewhere.

H. Slab Finishes: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces. Provide the following finishes:
1. Float finish for interior steps and ramps and surfaces to receive waterproofing, roofing, or other direct-applied material.

2. Troweled finish for floor surfaces and floors to receive floor coverings, paint, or other thin film-finish coatings.
3. Trowel and fine-broom finish for surfaces to receive thin-set tile.
4. Nonslip-broom finish to exterior concrete platforms, steps, and ramps.

I. Cure formed surfaces by moist curing for at least seven days.

J. Begin curing concrete slabs after finishing. Keep concrete continuously moist for at least seven days.

K. Owner will engage a testing agency to perform field tests and to submit test reports.

L. Protect concrete from damage. Repair surface defects in formed concrete and slabs.

END OF SECTION 03300

SECTION 003540 - GYPSUM CEMENTITIOUS UNDERLAYMENT

## PART 1 GENERAL

### 1.01 SUMMARY

A. This is the recommended specification for Gyp-Crete Floor Underlayment in multifamily housing.

B. Floor/ceiling assembly, including finish flooring, shall achieve a minimum STC rating of 54.

C. Submittals: Manufacturer’s confirmation of design STC rating of assemblies..

### 1.02 SECTION INCLUDES

A. Gyp-Crete gypsum cement

B. Maxxon Floor Primer

C. Maxxon Overspray

D. Acoustical mat underlayment

### 1.03 QUALITY ASSURANCE

A. Installer's Qualifications: Installation of Gyp-Crete shall be by an applicator authorized by the Maxxon Corporation using Maxxon approved mixing and pumping equipment.

### 1.04 DELIVERY, STORAGE AND HANDLING

A. General Requirements: Materials shall be delivered in their original, unopened packages, and protected from exposure to the elements. Damaged or deteriorated materials shall be removed from the premises.

### 1.05 SITE CONDITIONS

A. Environmental Requirements: Before, during and after installation of Gyp-Crete, building interior shall be enclosed and maintained at a temperature above 50 degrees F (10 degrees C).

## PART 2 PRODUCTS

### 2.01 MATERIALS

A. Gypsum Cement: Floor underlayment Gyp-Crete 2000 gypsum cement as manufactured by the Maxxon Corporation, Hamel, MN. All others must receive prior approval.

B. Sand Aggregate: Sand shall be 1/8 inch (3 mm) or less, washed masonry or plaster sand, meeting requirements of Maxxon Corporation Sand Specifications 101.

C. Mix Water: Potable, free from impurities.

D. Subfloor Primer: Maxxon Floor Primer

E. Sealer: Maxxon Overspray

F. Acoustical mat underlayment: Maxxon Acousti-Mat II

2.02 MIX DESIGNS

A. General Requirements: Mix proportions and methods shall be in strict accordance with product manufacturer recommendations.

PART 3 EXECUTION

3.01 PREPARATION

A. Condition and Cleaning of Subfloor: Subfloor shall be structurally sound. General Contractor shall clean subfloor to remove mud, oil, grease, and other contaminating factors before the arrival of the Gyp-Crete underlayment crew.

B. Leak Prevention: Fill cracks and voids with a quick setting patching or caulking material where leakage of Gyp-Crete could occur.

C. Priming Subfloor: Prime the subfloor using the Maxxon Floor Primer. Priming instructions may vary according to the type of substrate, multiple coats may be necessary.

D. Expansion Joints: Allow joints to continue through the Gyp-Crete at the same width.

3.02 APPLICATION OF CEMENTITIOUS FLOORING

A. Scheduling: Application of Gyp-Crete shall not begin until the building is enclosed, including roof, windows, doors and other fenestration. Install after drywall installation unless tenant finish requirements identify partitioning after the pour.

B. Application: Place Gyp-Crete at 1-1/2 inch (19 mm) minimum over wood frame. Spread and screed Gyp-Crete to a smooth surface. Except at authorized joints, place Gyp-Crete as continuously as possible until application is complete so that no Gyp-Crete product slurry is placed against Gyp-Crete product that has obtained its initial set.

C. Drying: General Contractor shall provide continuous ventilation and adequate heat to rapidly remove moisture from the area until the Gyp-Crete is dry. General Contractor shall provide mechanical ventilation if necessary. Under the above conditions, for 3/4 inch (19 mm) thick
Gyp-Crete, 5-7 days is usually adequate drying time. To test for dryness, tape a 24 inch by 24 inch (609 mm by 609 mm) section of plastic or high density rubber mat to the surface of the underlayment. After 48-72 hours, if no condensation occurs, the underlayment shall be considered dry. Perform dryness test 5-7 days after pour.

## 3.03 PREPARATION FOR INSTALLATION OF GLUE DOWN FLOOR GOODS

A. Sealing: Seal all areas that receive glue down floor goods with Maxxon Overspray according to the Maxxon Corporation's specifications. Any floor areas where the surface has been damaged shall be cleaned and sealed regardless of floor covering to be used. Where floor goods manufacturers require special adhesive or installation systems, their requirements supersede these recommendations.

B. Floor Goods Procedures: See the Maxxon Corporation's "Procedures for Attaching Finished Floor Goods to Maxxon Underlayments" brochure for guidelines for installing finished floor goods. This procedure is not a warranty and is to be used as a guideline only.

## 3.04 FIELD QUALITY CONTROL

A. Slump Test: Gyp-Crete mix shall be tested for slump as it's being pumped using a 2 inch by 4 inch (50 mm by 101 mm) cylinder resulting in a patty size of 8 inches (203 mm) plus or minus
1 inch (25 mm) diameter.

B. Field Samples: At least one set of 3 molded cube samples shall be taken from each day's pour during the Gyp-Crete application. Cubes shall be tested as recommended by the Maxxon Corporation in accordance with modified ASTM C 472. Test results shall be available to architect and/or contractor upon request from applicator.

## 3.05 PROTECTION

A. Protection From Heavy Loads: During construction, place temporary wood planking over Gyp-Crete wherever it will be subject to heavy wheeled or concentrated loads.

END OF SECTION

# SECTION 04810 - UNIT MASONRY ASSEMBLIES

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. See Division 5 Section "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.

B. Comply with ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

### 2.1 MASONRY UNITS

A. Face Brick: ASTM C 216, Grade MW or SW, Type FBS.

1. Products:

a. Acme Brick

2. Size: 3 inches wide by 2-5/8 inches high by 9-5/8 inches long.
3. Solid brick with exposed surfaces finished for ends of sills and caps.

### 2.2 MORTAR AND GROUT

A. Mortar: ASTM C 270, proportion specification.

1. Masonry Cement.
2. Do not use calcium chloride in mortar.
3. For masonry below grade or in contact with earth, use Type M.
4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions, and for other applications where another type is not indicated, use Type N.
5. Water-Repellent Additive: For mortar used with concrete masonry units made with integral water repellent, use product recommended by manufacturer of units.

### 2.3 REINFORCEMENT, TIES, AND ANCHORS

A. Veneer Anchors: Hot-dip galvanized steel, two-piece adjustable masonry veneer anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to studs, and acceptable to authorities having jurisdiction.

2.4 EMBEDDED FLASHING MATERIALS

A. Rubberized Asphalt Sheet Flashing: Pliable and highly adhesive rubberized asphalt compound, 26 mils (0.7 mm) thick, bonded to a polyethylene film, 4 mils (0.1 mm) thick, to produce an overall thickness of 30 mils (0.8 mm).

2.5 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded strips complying with ASTM D 1056, Grade 2A1.

B. Preformed Control-Joint Gaskets: Designed to fit standard sash block and to maintain lateral stability in masonry wall; made from styrene-butadiene rubber or PVC.

C. Weep Holes: Full head joint at 24” on center.

D. Proprietary Acidic Masonry Cleaner: Product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cut masonry units with saw. Install with cut surfaces and, where possible, cut edges concealed.

B. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

C. Stopping and Resuming Work: Rack back units; do not tooth.

D. Tool exposed joints slightly concave when thumbprint hard, unless otherwise indicated.

E. Keep cavities clean of mortar droppings and other materials during construction.

3.2 LINTELS

A. Install lintels where indicated.

B. Minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.3 FLASHING AND WEEP HOLES

A. Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

B. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing before covering with mortar.

1. Extend flashing 4 inches (100 mm) into masonry at each end and turn up 2 inches (50 mm) to form a pan.

## 3.4 CLEANING

A. Clean masonry as work progresses. Remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly cured, clean exposed masonry.

1. Wet wall surfaces with water before applying acidic cleaner, then remove cleaner promptly by rinsing thoroughly with clear water.
2. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 04810

# SECTION 05511 - METAL STAIRS

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Structural Performance:

1. Provide stairs capable of withstanding a uniform load of 100 lbf/sq. ft. (4.79 kN/sq. m) and a concentrated load of 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm). Uniform and concentrated loads need not be assumed to act concurrently.
2. Provide railings capable of withstanding structural loads required by ASCE 7.

## PART 2 - PRODUCTS

### 2.1 METALS

A. Rolled Steel Floor Plate: ASTM A 786/A 786M.

B. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25 (Grade 170).

### 2.2 MISCELLANEOUS MATERIALS

A. Concrete: Pre-cast concrete stair treads.

### 2.3 FABRICATION

A. Welding: Use materials and methods that minimize distortion and develop strength of base metals. At exposed connections, finish welds and surfaces smooth.

B. Stair Framing: Fabricate stringers of steel channels.

### 2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal stairs after assembly.

B. Hot-dip galvanize steel stairs at exterior locations.

C. Prepare uncoated ferrous metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning," and paint with a fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Attach handrails to wall with wall brackets. Use type of bracket with predrilled hole for exposed bolt anchorage.

END OF SECTION 05511

# SECTION 06100 - ROUGH CARPENTRY

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Model code evaluation reports for wood-preservative treated wood engineered wood products and metal framing anchors.

## PART 2 - PRODUCTS

### 2.1 WOOD PRODUCTS, GENERAL

A. Lumber: Provide dressed lumber, S4S, marked with grade stamp of inspection agency.

B. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

### 2.2 TREATED MATERIALS

A. Preservative-Treated Materials: AWPA C2, except that lumber not in ground contact and not exposed to the weather may be treated according to AWPA C31 with inorganic boron (SBX).

1. Use treatment containing no arsenic or chromium.
2. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
3. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

B. Provide preservative-treated materials for items indicated on Drawings, and the following:

1. Wood members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Concealed members in contact with masonry or concrete.
3. Wood floor plates that are installed over concrete slabs-on-grade.

### 2.3 LUMBER

A. Dimension Lumber:

1. Maximum Moisture Content: 15 percent for 2-inch nominal (38-mm actual) thickness or less, 19 percent for more than 2-inch nominal (38-mm actual) thickness.
2. Non-Load-Bearing Interior Partitions: Construction or No. 2: .
3. Framing Other Than Non-Load-Bearing Partitions: Construction or No. 2: .

B. Miscellaneous Lumber: Construction, or No. 2 grade with 19 percent maximum moisture content of any species. Provide for nailers, blocking, and similar members.

## 2.4 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: Plywood, Exposure 1, C-D Plugged, fire-retardant treated, not less than 1/2 inch (12.7 mm) thick.

## 2.5 MISCELLANEOUS PRODUCTS

A. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

1. Power-Driven Fasteners: CABO NER-272.
2. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

B. Metal Framing Anchors: Structural capacity, type, and size indicated.

1. Use anchors made from hot-dip galvanized steel complying with ASTM A 653/A 653M, G60 (Z180) coating designation for interior locations where stainless steel is not indicated.
2. Use anchors made from stainless steel complying with ASTM A 666, Type 304 for exterior locations and where indicated.

C. Sill-Sealer: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Securely attach rough carpentry to substrates, complying with the following:

1. CABO NER-272 for power-driven fasteners.
2. Published requirements of metal framing anchor manufacturer.

END OF SECTION 06100

# SECTION 06160 - SHEATHING

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Model code evaluation reports for preservative-treated plywood foam-plastic sheathing and building wrap.

## PART 2 - PRODUCTS

### 2.1 WOOD PANEL PRODUCTS, GENERAL

A. Plywood: DOC PS 1.

B. Oriented Strand Board: DOC PS 2.

### 2.2 WALL SHEATHING

A. Plywood Wall Sheathing: Exterior, Structural I sheathing.

B. Oriented-Strand-Board Wall Sheathing: Exposure 1, Structural I sheathing.

### 2.3 ROOF SHEATHING

A. Plywood Roof Sheathing: Exterior, Structural I sheathing.

B. Oriented-Strand-Board Roof Sheathing: Exposure 1, Structural I sheathing.

C. Composite Nail Base Insulated Roof Sheathing: Polyisocyanurate foam with oriented strand board laminated to one face complying with ASTM C 1289, Type V.

### 2.4 SUBFLOORING AND UNDERLAYMENT

A. Combination Subfloor-Underlayment:

1. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exposure 1, Structural I, Underlayment single-floor panels.
2. Oriented-Stand-Board Combination Subfloor-Underlayment: Exposure 1 single-floor panels.

B. Subflooring:

1. Plywood Subflooring: Exposure 1, Structural I single-floor panels or sheathing.

2. Oriented-Strand-Board Subflooring: Exposure 1, Structural I sheathing.

C. Underlayment:

1. Plywood Underlayment for Resilient Flooring: Slab on grade at first floor, cementitious self-leveling floor underlayment at second floor.
2. Plywood Underlayment for Ceramic Tile: Slab on grade at first floor, cementitious self-leveling floor underlayment at second floor.
3. Plywood Underlayment for Carpet: Slab on grade at first floor, cementitious self-leveling floor underlayment at second floor.

## 2.5 MISCELLANEOUS PRODUCTS

A. Fasteners: Size and type indicated.

1. For roof sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
2. Power-Driven Fasteners: CABO NER-272.

B. Weather-Resistant Sheathing Paper:

1. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.
2. Building Paper: UBC Standard 14-1, Grade D (water-vapor-permeable, kraft building paper), except that water resistance shall be not less than 1 hour and water-vapor transmission shall be not less than 75 g/sq. m x 24 h.
3. Building Wrap: ASTM E 1677, Type I air retarder; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

C. Sheathing Joint-and-Penetration Treatment Materials:

1. Sealant for Gypsum Sheathing Board: Joint sealant recommended by sheathing manufacturer for application indicated.
2. Sheathing Tape for Gypsum Sheathing Board: Self-adhering glass-fiber tape recommended by sheathing and tape manufacturers for application indicated.
3. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

D. Adhesives for Field Gluing Panels to Framing: APA AFG-01.

E. Flexible Flashing: Adhesive rubberized-asphalt compound, bonded to polyethylene film, with an overall thickness of 0.030 inch (0.8 mm).

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Securely attach to substrates, complying with the following:

1. CABO NER-272 for power-driven fasteners.

B. Fastening Methods:

1. Combination Subfloor-Underlayment:

a. Glue and nail to wood framing.
b. Screw to cold-formed metal framing.

2. Subflooring:

a. Glue and nail to wood framing.
b. Screw to cold-formed metal framing.

3. Wall and Roof Sheathing:

a. Nail to wood framing.
b. Screw to cold-formed metal framing.

4. Underlayment:

a. Nail to subflooring.

C. Sheathing Joint-And-Penetration Treatment: Seal sheathing joints according to sheathing manufacturer's written instructions.

D. Building Wrap Installation:

1. Apply building wrap immediately after sheathing is installed.
2. Seal seams, edges, fasteners, and penetrations with tape.
3. Extend into jambs of openings and seal corners with tape.

END OF SECTION 06100

# SECTION 06176 - METAL-PLATE-CONNECTED WOOD TRUSSES

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads indicated without exceeding TPI 1 deflection limits.

B. Submittals: Product Data, Shop Drawings, and structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

D. Comply with applicable requirements and recommendations of the following publications:

1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

E. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review, any species, graded visually or mechanically.

1. Provide dry lumber with 15 percent maximum moisture content at time of dressing.

B. Connector Plates: TPI 1, fabricated from hot-dip galvanized steel sheet complying with ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 (Z180) coating designation; and not less than 0.036 inch (0.9 mm) thick.

C. Fasteners: Where trusses are exposed to weather or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

D. Metal Framing Anchors: Provide framing anchors made from hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

2.2 FABRICATION

A. Assemble trusses using jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted. Fabricate wood trusses within manufacturing tolerances in TPI 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install and brace trusses according to TPI recommendations and as indicated. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

B. Anchor trusses securely at bearing points; use metal framing anchors. Install fasteners through each fastener hole in metal framing anchor.

C. Securely connect each truss ply required for forming built-up girder trusses. Anchor trusses to girder trusses.

D. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install bracing to comply with Division 6 Section "Rough Carpentry."
2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.

E. Install wood trusses within installation tolerances in TPI 1.

F. Do not cut or remove truss members.

G. Remove wood trusses that are damaged or do not meet requirements and replace with trusses that do meet requirements.

END OF SECTION 06176

# SECTION 07210 - BUILDING INSULATION

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Surface-Burning Characteristics: ASTM E 84, and as follows:

1. Flame-Spread Index: 25 or less where exposed; otherwise, as indicated in Part 2 "Insulation Products" Article.
2. Smoked-Developed Index: 450 or less.

## PART 2 - PRODUCTS

### 2.1 INSULATION PRODUCTS

A. Mineral-Fiber-Blanket Insulation:
1. ASTM C 665, Type III, Class A, foil faced on 1 side with fibers manufactured from glass, slag wool, or rock wool, with flame-spread index of 25 or less.

B. Glass-Fiber Loose-Fill Insulation:
1. ASTM C 764, Type 2, poured application, with flame-spread index of 25 or less.

C. Cellulose Loose Fill Insulation
1. ASTM C-739

D. Glass Fiber Batt insulation, kraft faced:
1. ASTM C665, Type II, Class C, Category 1
2. ASTM E 96 Permeability , Kraft 1.0 perm

### 2.2 ACCESSORIES

A. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed to fit between roof framing members and to provide cross-ventilation between attic spaces and vented eaves.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install insulation in areas and in thicknesses indicated or required to produce R-values indicated. Cut and fit tightly around obstructions and fill voids with insulation.

B. Except for loose-fill insulation and insulation that is friction fitted in stud cavities, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

C. For cellulose loose fill insulation determine bag count necessary to achieve R-value indicated and maintain a record of insulation installed.

D. Place loose-fill insulation to comply with

1. CIMA's Special Report #3, "Standard Practice for Installing Cellulose Insulation."

2. ASTM Standard C-1015, Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation

E. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage. Locate seams at framing members, overlap, and seal with tape.

END OF SECTION 07210

# SECTION 07311 - ASPHALT SHINGLES

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Identify each bundle of shingles with appropriate markings of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class C.
2. Wind-Resistance-Test Characteristics
   a. ASTM D 3161(not suitable where wind speed is 110 mph or higher) or UL 997, passed.
   **d.**

C. Warranties: Provide standard manufacturer's written warranty, signed by manufacturer agreeing to promptly repair or replace asphalt shingles that fail in materials or workmanship within 30 years from date of Substantial Completion, prorated, with first 3 years nonprorated.

## PART 2 - PRODUCTS

### 2.1 ASPHALT SHINGLES

A. Fiberglass Shingles: ASTM D 3462, antifungal, min 235 lb/sq, seal tab and as follows:

1. Laminated-Strip Asphalt (Architectural) Shingles: Laminated, multi-ply overlay construction, mineral-granule surfaced, and self-sealing. Straight cut butt edge.
3.

### 2.2 ACCESSORIES

A. Felts: ASTM D 226 or ASTM D 4869, Type II, asphalt-saturated organic felts.

B. Self-Adhering Sheet Underlayment: ASTM D 1970, SBS-modified asphalt; mineral-granule or slip-resisting-polyethylene surfaced; with release paper backing; cold applied.

C. Ridge Vent: Rigid UV-stabilized plastic ridge vent with nonwoven geotextile filter strips and with external deflector baffles; for use under ridge shingles.

D. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

E. Roofing Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel shingle nails, minimum 0.120-inch (3-mm) diameter, of sufficient length to penetrate 3/4 inch (19 mm) into solid wood decking or extend at least 1/8 inch (3 mm) through OSB or plywood sheathing.

F. Sheet Metal Flashing and Trim: Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."

1. Sheet Metal: Zinc-tin alloy-coated stainless steel.
2. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual."
3. Drip Edge: Formed sheet metal with at least a 2-inch (50-mm) roof deck flange and a 1-1/2-inch (38-mm) fascia flange with a 3/8-inch (9.6-mm) drip at lower edge.
4. Open-Valley Flashing: Fabricate with 1-inch- (25-mm-) high inverted-V profile at center of valley and equal flange widths of 12 inches (300 mm).

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Comply with recommendations in ARMA's "Residential Asphalt Roofing Manual" and with asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Apply self-adhering sheet underlayment at eaves and rakes from edges of roof to at least 24 inches (600 mm) inside exterior wall line.

C. Apply self-adhering sheet underlayment at valleys extending 18 inches (450 mm) on each side.

D. Install valleys complying with ARMA and NRCA instructions. Construct sheet metal open valleys.

E. Install metal flashings and other sheet metal to comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim," recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

F. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

END OF SECTION 07311

SECTION 07460– SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide exterior clapboard siding.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vinyl Siding: Minimum Thickness of .042
   1. Color to be selected by architect.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Allow for expansion and contraction. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other trades.

B. Restore damaged components. Clean and protect work from damage.

END OF SECTION

# SECTION 07841 - THROUGH-PENETRATION FIRESTOP SYSTEMS

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and product certificates signed by manufacturer certifying that products furnished comply with requirements.

B. Provide firestopping systems with fire-resistance ratings indicated by reference to UL designations as listed in its "Fire Resistance Directory," or to designations of another testing agency acceptable to authorities having jurisdiction.

C. Provide through-penetration firestopping systems with F-ratings indicated, as determined according to ASTM E 814, but not less than fire-resistance rating of construction penetrated.

1. Provide through-penetration firestopping systems with T-ratings as well as F-ratings, as determined according to ASTM E 814, where indicated.

D. For exposed firestopping, provide products with flame-spread indexes of less than 25 and smoke-developed indexes of less than 450, as determined according to ASTM E 84.

## PART 2 - PRODUCTS

### 2.1 FIRESTOP SYSTEMS

A. Any through-penetration firestop system that is classified by UL for the application and with F-rating indicated may be used.

B. UL-classified system designations are indicated on Drawings.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install firestopping systems to comply with requirements listed in testing agency's directory for indicated fire-resistance rating.

B. Identification: Identify through-penetration firestop systems with permanent labels attached to surfaces adjacent to firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb."
2. Classification/listing designation of applicable testing and inspecting agency.
3. Through-penetration firestop system manufacturer's name and product name.

END OF SECTION 07841

SECTION 08212 - DOORS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data, including details of construction.

PART 2 - PRODUCTS

2.1 PANEL DOORS

A. Exterior doors:
   3. Hollow Metal Entry Doors for Apartments:
      a. Size: 36” wide x 80” high or as noted on door schedule.
      b. Rating: as noted on door schedule
      c. Door Face Panel: Formed steel
      d. Finish: Prefinished in architect’s choice of manufacture’s standard colors.
      e. Core: Insulating foam
      f. Thermal performance: U value not greater than 0.34.
      g. Hardware:
         1) Hinges: (3) standard weight self-closing mortise hinges on doors 7’-0” height or smaller
         2) Lever handle locksets, entrance function
         3) Peephole (2 peepholes on units designated for handicap)
         4) Single cylinder deadbolt.
         5) Head and jamb seals
         6) Door bottom seal
         7) Threshold maximum 1/2” high.
   4. Hollow Metal Patio Doors for Apartments:
      a. Size: as noted on door schedule.
      b. One leaf fixed, one operable. At handicap accessible units, operable leaf shall be at least 36” wide.
      c. Door Face Panel: Formed steel
      d. Finish: Prefinished in architect’s choice of manufacture’s standard colors.
      e. Core: Insulating foam
      f. Thermal performance: U value not greater than 0.34.
      g. Hardware:
         1) Hinges: (3) standard weight self-closing mortise hinges on doors 7’-0” height or smaller
         2) Lever handle locksets, entrance function
         3) Single cylinder deadbolt.
         4) Head and jamb seals
         5) Door bottom seal
         6) At handicap accessible units threshold shall be maximum 1/2” high.

B. Interior Doors:
   1. Door Panel: Masonite Molded Panel doors shall be fabricated using loose lay up assembly that includes molded wood fiber facing, wood, or MDF stiles, wood or MDF rails and corrugated cell core. Door facings ar to be bonded to stiles, rails and core forming a 3-ply structural attachment. Water based latex primer used on door facing, unless factory pre-finished.
   2. Mounting surface for latching hardware to be reinforces with solid internal support. Hinge preparations for 1-3/8" thick doors to be machined for standard weight radius mortise 3-1/2" hinges. Face bore for cylindrical lock and deadbolt are to be 2-1/8" diameter at 2-3/4" or 2-3/8" backset.
   3. Vertical edge of door to be square.
   4. Door Frame: Wood jambs shall be fabricated as a flat jamb with doorstop applied or 2-piece split jamb. Hinge jamb preparations for 1-3/8" thick doors to be machined for standard weight radius mortise 3-1/2" hinges. Strike jamb preparations are to be machined for full lip cylindrical strike plate. Double door units shall include preparations for ball catch located at the top of door on both door panels designed to strike into the head jamb.
   5. Hinges: (3) standard weight radius mortise hinges are required on door 7'-0" height or smaller.

## 2.2 OVERHEAD DOORS

A. Garage sectional.doors, power operated:
   1. Embossed metal panel
   2. Prefinished in architect's selection of manufacturer's standard colors.
   3. Weatherstripping at top, sides and bottom.
   4. Door operator controlled by pushbutton station, **keypad** and remote.
   5. Furnish 2 remote operators with each door.
   6. Safety sensors interconnected with door operator.

B. Coiling service doors – manually operated:
   1. Metal rolling (corrugated coil) sheet panel
   2. Medium duty
   3. Prefinished in architect's selection of manufacturer's standard colors.
   4. Weatherstripping at head, jambs and sill
   5. Maximum U-value not greater than 0.34

## 2.3 DELIVERY, STORAGE & HANDLING

A. Delivery: Reasonable care shall be exercised during shipping and handling in keeping with the decorative nature of product

B. Storage & Protection: Store upright in a dry, well ventilated building or shelter at a constant temperature. Do not store in damp, freshly plastered, drywall or concrete areas until materials have completely dried. Doors should be stored at least 10' away from any heat source to help prevent uneven drying.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site verification of substrate conditions, which have been previously complete, are acceptable for the product installation instructions in accordance with manufacturer's specifications. Verify that door frame openings are constructed plumb, true and level before beginning installation process. Select fasteners of adequate type, number and quality to perform the intended functions.

3.2 INSTALLATION

A. Remove protective packaging just prior to installation. Installer shall be xperienced in performing work required and shall be specialized in the installation of wok similar to that required for this project. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product packaging instruction for installation.

B. Align factory-fitted doors in frames for uniform clearances.

C. Repair, refinish, or replace factory-finished doors damaged during installation as directed by Architect.

END OF SECTION 08212

SECTION 08561 - VINYL WINDOWS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Quality Standard: Comply with AAMA/NWWDA 101/I.S.2/NAFS.

1. Provide AAMA- or WDMA-certified vinyl windows with an attached label.

B. Warranty: 10 year replacement warranty on glass seal

PART 2 - PRODUCTS

2.1 VINYL WINDOWS

A. Products:

1. Vinyl Windows shall be
   **a. Wind rated according to project location.**
   **b. Windows shall have a U-Factor of 0.19 and a solar heat gain coefficient (SHGC) .28**

B. Window Types: As indicated on Drawings.
1. Single hung

C. Window Color: White or Beige.

D. Glaze units with clear, low-e coated, argon-filled, sealed insulating glass.

**E. Windows in bedrooms shall have a net clear opening for emergency escape and rescue of not less than 24” high, 20” wide, and not less than 5.7 square feet in area.**

PART 3 - EXECUTION

3.1 INSTALLATION

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

B. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.

C. Adjust operating panels, screens, and hardware to provide a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

D. Clean glass and vinyl surfaces immediately after installing windows. Remove nonpermanent labels from glass surfaces.

E. END OF SECTION 08561

# SECTION 08710 - DOOR HARDWARE

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Allowances: Provide hardware under Hardware Allowance in Division 1 Section "Price and Payment Procedures."

B. Submittals: Hardware schedule.

C. Deliver keys to Owner.

D. Fire-Resistance-Rated Assemblies: Provide products that comply with NFPA 80 and are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for applications indicated. On exit devices provide label indicating "Fire Exit Hardware."

## PART 2 - PRODUCTS

### 2.1 HARDWARE

A. Peepholes
   1. 120° viewing angle

B. Deadbolt locks
   1. Single cylinder w/thumbturn

C. Hinges:

   1. Brass/bronze hinges with stainless-steel pins for exterior.
   2. Nonremovable hinge pins for exterior and public interior exposure.
   3. Ball-bearing hinges for doors with closers and entry doors.
   4. 3 hinges for 1-3/4-inch- (45-mm-) thick doors 90 inches (2300 mm) or less in height; 4 hinges for doors more than 90 inches (2300 mm) in height.

D. Locksets and Latchsets:

   1. BHMA A156.2, Series 4000, Grade 2 for bored locks and latches.
   2. BHMA A156.3, Grade 1 for exit devices.
   3. BHMA A156.5, Grade 1 for auxiliary locks.
   4. BHMA A156.12, Series 5000, Grade 1 for interconnected locks and latches.
   5. BHMA A156.13, Series 1000, Grade 1 for mortise locks and latches.
   6. Lever handles on locksets and latchsets,.
   7. Provide trim on exit devices matching locksets.

E. Key locks to Owner's master-key system.

1. Cylinders with six-pin tumblers and removable cores.
2. Provide construction keying.
3. Provide key control system, including cabinet.

F. Closers:

1. Mount closers on interior side (room side) of door opening. Provide regular-arm, parallel-arm, or top-jamb-mounted closers as necessary.
2. Adjustable delayed opening (accessible to people with disabilities) feature on closers.

G. Provide wall stops or floor stops for doors without closers.

H. Provide hardware finishes as follows:

1. Hinges: Matching finish of lockset/latchset.
2. Locksets, Latchsets, and Exit Devices: Bright brass, clear coated;.
3. Other Hardware: Matching finish of lockset/latchset.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Mount hardware in locations recommended by the Door and Hardware Institute unless otherwise indicated.

END OF SECTION 08710

# SECTION 09250 - GYPSUM BOARD

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assemblies per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

C. STC-Rated Assemblies: Provide materials and construction identical to those tested in assemblies per ASTM E 90 and classified per ASTM E 413 by a qualified independent testing and inspecting agency.

## PART 2 - PRODUCTS

### 2.1 PANEL PRODUCTS

A. Provide in maximum lengths available to minimize end-to-end butt joints.

B. Interior Gypsum Board: ASTM C 36/C 36M or ASTM C 1396/C 1396M, in thickness indicated, with manufacturer's standard edges. Type X where indicated.

C. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M or ASTM C 1396/C 1396M, in thickness indicated. Type X where required for fire-resistance-rated assemblies and where indicated.

### 2.2 ACCESSORIES

A. Trim Accessories: ASTM C 1047, formed from galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet. For exterior trim, use accessories formed from hot-dip galvanized-steel sheet, plastic, or rolled zinc.

1. Provide cornerbead at outside corners unless otherwise indicated.
2. Provide LC-bead (J-bead) at exposed panel edges.
3. Provide control joints where indicated.

B. Aluminum Accessories: Extruded-aluminum accessories indicated with manufacturer's standard corrosion-resistant primer.

C. Joint-Treatment Materials: ASTM C 475/C 475M.

1. Joint Tape: Paper unless otherwise recommended by panel manufacturer.
2. Joint Compounds: Drying-type, ready-mixed, all-purpose compounds.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install gypsum board to comply with ASTM C 840.

1. Isolate gypsum board assemblies from abutting structural and masonry work. Provide edge trim and acoustical sealant.
2. Single-Layer Fastening Methods: Fasten gypsum panels to supports with screws.

B. Fire-Resistance-Rated Assemblies: Comply with requirements of listed assemblies.

C. Finishing Gypsum Board: ASTM C 840.

1. At concealed areas, unless a higher level of finish is required for fire-resistance-rated assemblies, provide Level 1 finish: Embed tape at joints.
2. At substrates for tile, provide Level 2 finish: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges.
3. Unless otherwise indicated, provide Level 4 finish: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges.
4. Where indicated, provide Level 5 finish: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges. Apply skim coat to entire surface.

D. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

END OF SECTION 09250

# SECTION 09310 - CERAMIC TILE

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data for tile and installation materials and Samples for tile.

B. Floor Tiles: Static coefficient of friction not less than 0.6 for level surfaces and 0.8 for ramps, per ASTM C 1028.

## PART 2 - PRODUCTS

### 2.1 CERAMIC TILE

A. Manufacturer: Interceramic or equal

B. Tile:
1. Montreaux, 18” x 18” Color: Brun at Floor in Clubhouse
2. Montreauz, 6” x 6” Color: Brun at wainscot at Clubhouse toilet rooms

C. Ceramic tile that complies with Standard grade requirements in ANSI A137.1, "Specifications for Ceramic Tile."

D. Ceramic Mosaic Floor Tile: Glazed, porcelain impervious natural clay or porcelain cushion-edged tile.

1. Surface: Slip resistant, with abrasive admixture.
2. Module Size: 12 by 12 inches.
3. Color: As selected.
4. Tiles back- or edge-mounted into sheets.

### 2.2 INSTALLATION MATERIALS

A. VOC Limit for Adhesives and Fluid-Applied Waterproofing Membranes: 65 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Setting and Grouting Materials: Comply with material standards in ANSI's "Specifications for the Installation of Ceramic Tile" that apply to materials and methods indicated.

1. Thin-Set Mortar Type: Dry-set portland cement.

2. Grout Type: Standard cement unless otherwise indicated.

3. Grout Color: As selected.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with tile installation standards in ANSI's "Specifications for the Installation of Ceramic Tile" that apply to materials and methods indicated.

1. For installations indicated below, follow procedures in ANSI's "Specifications for the Installation of Ceramic Tile" for providing 95 percent mortar coverage.
   a. Tile floors in laundries.
   b. Tile floors composed of tiles 8 by 8 inches or larger.
   c. Tile floors composed of rib-backed tiles.

B. Comply with TCA's "Handbook for Ceramic Tile Installation."

C. Floor Tile Installation Method(s):
1. Over Concrete Subfloors: TCA F112 (cement mortar bed bonded to concrete).

D. Wall Tile Installation Method(s):
1. Over Gypsum Board: TCA W243 (thin-set mortar on gypsum board).

E. Lay tile in grid pattern, unless otherwise indicated. Align joints where adjoining tiles on floor, base, walls, and trim are the same size.

F. 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 plates, collars, or covers overlap tile.

END OF SECTION 09310

SECTION 09627 – SPECIALTY FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide specialty flooring and floor preparation.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Mock-Ups: Provide mock-up as required to demonstrate quality of workmanship.

1.4 WARRANTY

A. 5 year commercial warranty

PART 2 - PRODUCTS

2.1 MATERIALS

A. Laminate Flooring:
   1. Manufacturer/Style/Pattern:
      a. Quick-Step/QS 700 collection/tbd
   2. Type: NEMA LD 3.
   3. Thickness: 9/32”
   4. Auxiliary Materials:
      a. Polyethylene vapor retarder, 6 mils.
      b. Trim, moldings, thresholds, and transition strips.
      c. Underlayment
         1) Quick-Step Unisound Combi-Floor
      d. adhesives, mastics, and fasteners.;

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other trades.

B. Provide control joints over joints in substrate and at approved locations.

C. Restore damaged work. Replace work, which cannot be repaired. Clean and protect work from damage.

END OF SECTION

# SECTION 09652 - RESILIENT SHEET FLOORING

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and Samples.

B. Fire-Test Response: Resilient flooring has critical radiant flux classification of Class II or Class I, not less than 0.22 W/sq. cm per ASTM E 648.

## PART 2 - PRODUCTS

### 2.1 SHEET VINYL FLOOR COVERING

A. Color and Pattern:

B. Sheet Vinyl Floor Covering With Backing: ASTM F 1303, Type II, minimum binder content of 34 percent, Grade 1.

C. Wearing Surface: Embossed.

D. Sheet Width: As standard with manufacturer.

E. Seaming Method: Standard (butted).

### 2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement- or blended hydraulic cement-based formulation provided or approved by flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit sheet vinyl floor covering and substrate conditions indicated.

C. Metal Edge Strips: Extruded aluminum in maximum available lengths to minimize joints.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Prepare concrete substrates according to ASTM F 710. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

B. Unroll sheet floor coverings and allow them to stabilize before cutting and fitting.

C. Maintain uniformity of resilient sheet flooring direction, and match edges for color shading at seams.

D. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in substrates.

END OF SECTION 09652

# SECTION 09680 - CARPET

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and Samples.

B. Extra Materials: Deliver to Owner full-width carpet equal to 5 percent of each type and color carpet installed, packaged with protective covering for storage.

## PART 2 - PRODUCTS

### 2.1 CARPET

A. Fiber Content: 100 percent nylon 6

B. Pile Characteristic: Cut pile.

C. Width: 12 feet (3.7 m).

### 2.2 CARPET CUSHION

A. Traffic Classification: CCC Class I, moderate traffic.

B. Fiber Cushion: Synthetic.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Comply with CRI 104.

B. Installation Method: Direct glue-down Stretch in.

C. Maintain uniformity of carpet direction and lay of pile. At doorways, center seams under door in closed position. Bind or seal cut edges as recommended by carpet manufacturer.

D. Install pattern parallel to walls and borders.

END OF SECTION 09680

# SECTION 09910 - PAINTING

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Summary: Paint exposed surfaces unless otherwise indicated.

1. Paint the back side of access panels.
2. Do not paint prefinished items, items with an integral finish, operating parts, and labels unless otherwise indicated.

B. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

## PART 2 - PRODUCTS

### 2.1 PAINT

A. Material Compatibility: Provide materials that are compatible with one another and with substrates.

1. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Remove hardware, lighting fixtures, and similar items that are not to be painted. Mask items that cannot be removed. Reinstall items in each area after painting is complete.

B. Clean and prepare surfaces in an area before beginning painting in that area. Schedule painting so cleaning operations will not damage newly painted surfaces.

### 3.2 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use brushes only for exterior painting and where the use of other applicators is not practical.

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

1. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply stains and transparent finishes to produce surface films without color irregularity, cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other imperfections. Use multiple coats to produce a smooth surface film of even luster.

## 3.3 INTERIOR PAINT APPLICATION SCHEDULE

A. Gypsum Board:

1. Eggshell Latex: Two coats over primer/sealer: MPI INT 9.2A.

END OF SECTION 09910

# SECTION 10431 - SIGNS

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data, Shop Drawings, and Samples.

1. Submit full-size rubbings for metal plaques.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

B. Plastic Laminate: High-pressure laminate engraving stock with face and core in contrasting colors.

C. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils (0.076 mm) with pressure-sensitive adhesive backing, suitable for exterior applications.

### 2.2 SIGNS

A. Dimensional Characters: Cast-aluminum characters.

1. Finish and Color: As selected from manufacturer's full range.

B. Exterior Framed Panel Signs: Extruded-aluminum frames with translucent acrylic panels and matte-finished opaque acrylic characters chemically welded to faces of panels.

1. Finishes and Colors: As selected from manufacturer's full range.
2. Illuminated Signs: Manufacturer's standard fluorescent tube lighting including transformers, insulators, and other components.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate signs where indicated or directed by Architect. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

B. Wall-Mounted Signs:
   1. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.
   2. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes.

C. Dimensional Characters: Mount characters at projection distance from wall surface indicated.

END OF SECTION 10431

# SECTION 10522 - FIRE EXTINGUISHER CABINETS

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Fire-Rated, Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

## PART 2 - PRODUCTS

### 2.1 FIRE-PROTECTION CABINETS

A. Fire-Protection Cabinets: surface-mounted cabinets for fire extinguisher.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install cabinets at heights acceptable to authorities having jurisdiction.

B. Identification: Apply decals at locations indicated.

END OF SECTION 10522

# SECTION 10523 - FIRE EXTINGUISHERS

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Fire Extinguishers: NFPA 10, listed and labeled for the type, rating, and classification of extinguisher.

## PART 2 - PRODUCTS

### 2.1 FIRE EXTINGUISHERS

A. Portable Fire Extinguishers:
1. Stored-Pressure Antifreeze Type: UL-rated 2-A, 2.5-gal. (9.5-L) nominal capacity.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install mounting brackets in locations indicated at heights acceptable to authorities having jurisdiction.

B. Install fire extinguishers in cabinets where indicated.

END OF SECTION 10523

# SECTION 10675 - WIRE CLOSET SHELVING

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Structural Performance: Wire closet shelving system shall be capable of supporting the following weight (mass) per unit length:

1. With shelf supported by walls at both ends:

   a. Shelves 36 inches (914 mm) or less in length: 60 lb/ft. (90 kg/m).
   b. Shelves 37 to 48 inches (915 to 1219 mm) in length: 55 lb/ft. (82 kg/m).
   c. Shelves 49 to 60 inches (1220 to 1524 mm) in length: 50 lb/ft. (75 kg/m).
   d. Shelves 61 inches (1525 mm) or more in length: 40 lb/ft. (60 kg/m).

2. With shelf supported by a wall at one end only:

   a. Shelves 36 inches (914 mm) or less in length: 50 lb/ft. (75 kg/m).
   b. Shelves 37 to 48 inches (915 to 1219 mm) in length: 45 lb/ft. (67 kg/m).
   c. Shelves 49 to 60 inches (1220 to 1524 mm) in length: 40 lb/ft. (60 kg/m).
   d. Shelves 61 inches (1525 mm) or more in length: 35 lb/ft. (52 kg/m).

3. With shelf not supported by a wall at either end:

   a. Shelves 36 inches (914 mm) or less in length: 45 lb/ft. (67 kg/m).
   b. Shelves 37 to 48 inches (915 to 1219 mm) in length: 40 lb/ft. (60 kg/m).
   c. Shelves 49 to 60 inches (1220 to 1524 mm) in length: 35 lb/ft. (52 kg/m).
   d. Shelves 61 inches (1525 mm) or more in length: 30 lb/ft. (45 kg/m).

C. Verify dimensions by field measurements before ordering.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Steel Wire: ASTM A 853.

### 2.2 WIRE CLOSET SHELVING

A. Wire closet shelving, made from steel wire spaced not more than 1 inch (25 mm) o.c. and welded to longitudinal steel wire rods. Provide longitudinal wire rods at shelf edges and corners of lips, with not less than 4 longitudinal wire rods per shelf. Provide shelves of widths indicated

12-inch- (300-mm-) wide shelves unless otherwise indicated. Provides units complete with brackets, fasteners, end caps, and accessories indicated.

1. Provide fixed (nonadjustable) units of configurations and in quantities and sizes indicated.
2. Provide units with rod for clothes hangers where indicated.

## 2.3 FINISHES

A. Wire Shelving Finish: White polyester or vinyl applied over cleaned and conversion-coated metal.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install units in configurations indicated, complete with accessories indicated, and ready for use.

B. Install units level, plumb, and true to line, without warp or rack and anchor securely in place.

C. Repair, refinish, or replace wire closet shelving damaged during installation, as directed by Architect.

END OF SECTION 10675

# SECTION 10801 - TOILET AND BATH ACCESSORIES

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, No. 4 finish (satin), 0.0312-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, ASTM B 16 (ASTM B 16M), or ASTM B 30.

C. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T6 or 6463-T6.

D. Sheet Steel: ASTM A 1008/A 1008M, 0.0359-inch (0.9-mm) minimum nominal thickness.

E. Galvanized-Steel Sheet: ASTM A 653/A 653M, G60 (Z180).

F. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.

H. Tempered Glass: ASTM C 1048, Kind FT (fully tempered).

I. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

J. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

K. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

### 2.2 TOILET AND BATH ACCESSORIES

A. Paper Towel Dispenser:

1. Basis-of-Design Product:
2. Mounting: Surface.
3. Minimum Capacity: 400 C-fold or 525 multifold towels.
4. Material: Stainless steel, No. 4 finish (satin).
5. Lockset: Tumbler type.

6. Refill Indicators: Pierced slots at sides or front.

B. Toilet Tissue Dispenser:

1. Basis-of-Design Product:
2. Type: Single-roll dispenser.
3. Mounting: Surface mounted with concealed anchorage.
4. Material: Stainless steel Chrome-plated zinc alloy (zamac) or steel.
5. Operation: Noncontrol delivery with standard spindle.
6. Capacity: Designed for 4-1/2- or 5-inch- (114- or 127-mm-) diameter-core tissue rolls.

C. Liquid-Soap Dispenser:

1. Basis-of-Design Product:
2. Mounting: Surface.
3. Stainless-Steel Soap Valve: Designed for dispensing soap in liquid form.
4. Lockset: Tumbler type.
5. Refill Indicator: Window type.

D. Grab Bar:

1. Basis-of-Design Product:
2. Material: Stainless steel, 0.050 inch (1.3 mm) thick.
3. Mounting: Exposed.
4. Gripping Surfaces: Slip-resistant texture.
5. Outside Diameter: 1-1/2 inches (38 mm) for heavy-duty applications.

E. Mirror Unit:

1. Basis-of-Design Product:
2. Frame: Stainless-steel channel.

F. Shower Curtain Rod:

1. Basis-of-Design Product:
2. Outside Diameter: 1 inch (25.4 mm).
3. Mounting: Flanges with exposed fasteners.
4. Material and Finish: Polished chrome-plated brass.

G. Robe Hook:

1. Basis-of-Design Product:
2. Description: Single-prong unit.
3. Material and Finish: Polished chrome-plated brass.

H. Towel Bar:

1. Basis-of-Design Product:
2. Description: 3/4-inch- (19-mm-) round tube with circular end brackets.
3. Mounting: Flanges with concealed fasteners.
4. Length: 18 inches (457 mm).

5. Material and Finish: Polished aluminum.

I. Underlavatory Guard:

1. Basis-of-Design Product:
2. Description: Insulating pipe coverings for supply and drain piping assemblies, which prevent direct contact with and burns from piping, and allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install accessories using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

B. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items. Remove temporary labels and protective coatings.

END OF SECTION 10801

SECTION 11451 - APPLIANCES

PART 1 - GENERAL

1.1 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. ANSI: Provide gas-burning appliances that comply with ANSI Z21 Series standards.

C. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with ANSI A117.1.

D. Energy Ratings: Where products are required to be Energy Star qualified, provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

PART 2 - PRODUCTS

2.1 RESIDENTIAL APPLIANCES

A. Electric Range for apartments:
1. 30 inch wide slide-in
2. 4 burners
3. Porcelain oven – manual clean
4. Stainless steel finish

C. Microwave/hood combination unit:
1. 30” wide built-in under cabinet microwave oven
2. Integrated exhaust fan
3. Range of power settings
4. Rotating turntable
5. Digital timer.
6. Stainless steel finish

D. Refrigerator/Freezer for typical apartments:
1. Shall fit in the space provided
2. Freestanding two door, with top mounted freezer
3. Baked enamel on steel interior cabinet liners
4. Nominal 17 cu ft capacity
5. Frost free

6. Built-in icemaker
8. Stainless steel finish

F. Dishwasher for apartments:
1. 24” wide built-in under counter automatic dishwasher
3. Stainless steel finish

H. Garbage Disposal:
1. 1/3 hp

PART 3 - EXECUTION

3.1 INSTALLATION

A. Built-in Appliances: Securely anchor to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

B. Freestanding Appliances: Place in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

C. Test each item of residential appliances to verify proper operation. Make necessary adjustments.

D. Verify that accessories required have been furnished and installed.

END OF SECTION 11451

# SECTION 12356 - RESIDENTIAL CASEWORK GENERAL

## 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data, Shop Drawings, and material Samples.

B. Cabinets shall be a product certified in compliance with KCMA/ANSI A161.1 by the Kitchen Cabinet Manufacturers' Association.

C. Comply with KCMA/ANSI A161.2 for plastic-laminate countertops.

D. Verify dimensions by field measurements; measure for countertops after base cabinets are installed.

## PART 2 - PRODUCTS

## 2.1 CASEWORK

A. Cabinets:
   1. Species: Red Oak
   2. Construction style: Overlay
   3. Door style: Solid species stile and rail panel w/ 1/4" veneered inset
   4. Drawer style: Solid species
   5. Shelves: Adjustable
   6. Finish:
      a. Door/drawer/face frame: Stain, seal, varnish – factory prefinished.
      b. End panel: Wood grain melamine matching species finish
      c. Interior surfaces: Light birch melamine
   7. Hardware:
      a. Hinges: Semi concealed, self closing
      b. Drawer guides: dual sidetrack epoxy coated, 3/4 extension, 100 lb rating
      c. Pulls: Die cast or wrought metal pulls min 3 1/2". through-bolt or screw center
   8. Cabinet construction:
      a. Face frame: 3/4" kiln dried species.
      b. End panel: 1/2" industrial grade particleboard
      c. Back panel: 1/8" hardboard
      d. Top panel: 1/4" hardboard
      e. Bottom panel: 1/2"hardboard
      f. Hanging rails: 3/4" hardwood
      g. Upper shelves: 1/2" industrial grade particleboard
      h. Base shelves: 1/2" industrial grade particleboard (half shelf)
      i. Toe kick: 1/2" particleboard
      j. Drawers: 7/16" fiberboard full box w/ 1/8" hardboard bottom
      k. Doors: mortise and tenon joinery

B. Plastic-Laminate Countertops and Splashes:

1. Plastic Laminate: NEMA LD 3, Grade HGP.
2. Substrate: Particleboard, ANSI A208.1, Grade M-2 or exterior plywood, PS 1, Grade C-C Plugged, touch sanded.

C. Countertop Configuration:

1. Front Style: Rolled.
2. Backsplash: Curved or waterfall shape.
3. End Splash: Square edge.

## PART 3 - EXECUTION

### 3.1 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.

E. Fasten plastic-laminate countertops by screwing through corner blocks in base units into underside of countertop. Spline and glue joints in countertops and use concealed mechanical clamps.

F. Fasten solid-surface countertops by screwing through corner blocks in base units into underside of countertop. Align adjacent surfaces. Form seams 1/8 inch (3.2 mm) wide and adhere with manufacturer's recommended joint adhesive in color to match countertop. Dress joints smooth, remove surface scratches, and clean entire surface.

END OF SECTION 12356

# SECTION 12491 - HORIZONTAL LOUVER BLINDS

## PART 1 - GENERAL

### 1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and Samples.

B. Provide blinds passing flame-resistance testing according to NFPA 701.

C. Product Standard: Unless otherwise indicated, comply with WCMA A 100.1.

## PART 2 - PRODUCTS

### 2.1 HORIZONTAL LOUVER BLINDS

A. Products:

B. Louver Slats: Extruded PVC (vinyl), UV-stabilized and integrally colored.

C. Slat Width: 2 inches (50 mm).

D. Headrail: Formed steel or extruded aluminum; long edges returned or rolled; fully enclosing operating mechanisms on three sides and ends.

E. Tilt Operation: Manual with cord.

F. Valance: Manufacturer's standard.

G. Mounting: As indicated.

H. Fabrication: Comply with AWCMA Document 1029 unless otherwise indicated.

1. Fabricate concealed components from noncorrodible or corrosion-resistant-coated materials.
2. Provide lifting and tilting mechanisms with permanently lubricated moving parts.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install blinds level, plumb, and located not closer than 2 inches (51 mm) to interior face of glass.

1. Flush Mounted: Install blinds with louver edges flush with finish face of opening when slats are tilted open.
2. Jamb Mounted: Install headrail flush with face of opening jamb and head.
3. Head Mounted: Install headrail on face of opening head.
4. Recessed: Install headrail concealed within blind pocket.

B. Adjust horizontal louver blinds to operate smoothly and easily throughout entire operational range.

END OF SECTION 12491

**MECHANICAL SPECIFICATIONS INDEX**

SECTION 15010-MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1. CONDITIONS OF THE CONTRACT

A. The Conditions of the Contract (General, Supplementary, and other Conditions) and the General Requirements (Sections of Division 1) are hereby made a part of this Section.

B. This Section is a Division 15 Basic Materials and Methods Section and is a part of each Division 15 Section.

C. The Contractor shall be responsible for construction coordination of all work described in this section with the work specified in other sections of the specifications and shown on the Drawings. In advance of construction, coordinate and work out any minor problems with other trades to avoid conflicts therewith. However, if other minor problems are encountered, bring these problems to the attention of the Architect, who will make the final decisions as to correction.

1. All references and notations pertaining to coordination by the Contractor shall apply to constructions coordination. The Architect and Engineers have, to the best of their ability, coordinated the drawing and specifications to avoid conflicts between specified equipment and space required for such, and between architectural and engineering disciplines.

2. If substituted equipment (approved-equal) is to be used, the Contractor shall revise the 1/8" = 1'- 0" & 1/4" = 1'- 0” scale floor plans shown on the Drawings, indicating to scale, the equipment to be used. The purpose of these revised scale plans is to identify any problems with substituted equipment, and access and clearance requirements are maintained. These revised scale plans are to be submitted with the substituted equipment submittals.

3. Sheetmetal contractor shall provide 1/4" = 1'- 0" scale floor plans showing of ductwork systems with associated plumbing and electrical systems. The purpose of these plans will be to insure that the contractor is coordinated with each subcontractor and to locate all ductwork system, fire dampers and smoke dampers. If these plans are not submitted with equipment submittals, contractor shall incur all costs of engineer's additional review. Minimum of 16 hours.

4. Plumbing contractor shall provide 1/4" = 1'-0" scale floor plans showing exact location of sewer system in slab and each floor. Contractor shall verify that any footing or structural member is not a problem for penetration as shown on construction documents. If

problem arises, it shall be brought to the attention of the architect/engineer who will decide the method of correction. Corrections to work already completed and in place shall not constitute an increase in the contract amount. If these plans are not submitted with equipment submittals, contractor shall incur all costs of engineer's additional review. Minimum of 16 hours.

1.2. WORK INCLUDED

A. This section consists of General Requirements and Standard Specifications covering certain parts of work under Division 15 and is supplemented by other Division 15 sections covering additional work, requirements, and materials specifically applicable to the work of each section.

1.3. CODE AND REGULATORY AGENCY COMPLIANCE

A. Provide work and materials in full accordance with the latest rules and regulations of the following:

1. Occupational Safety and Health Administration

2. 2003 Arkansas Mechanical Code

3. 2003 Arkansas Plumbing Code

4. 1995 Arkansas Gas Code

5. Architectural Barriers Act of 1968: Public Law 90-480

6. ANSI-A171.1

7. 2002 Arkansas Fire Code, Vol I & Vol II

8. National Fire Protection Association 101, Life Safety Code,

9. ADA Code

10. Other applicable state and local laws and codes

1.4. QUALITY ASSURANCE

A. Manufacturers: Only firms regularly engaged in manufacturing of the mechanical services, equipment and specialties of types and sizes required, whose products have been in satisfactory use in similar service shall be used on this project.

B. Installers Qualifications: Only firms with successful installation experience on projects with work similar to that required for this project shall perform work on this project.

1.5. SUBMITTALS

A. Comply with Section 01300.

1.6. SITE EXAMINATION

A. Examine site, verify dimensions and locations against Drawings, and inform self of conditions under which work is to be done before submitting proposal. No allowance will be made for extra expense on account of error.

B. Information shown relative to existing services is based upon available records and data but is approximate only. Make minor deviations found necessary to conform with actual locations and conditions without extra cost. Verify location and elevation of utilities prior to commencement of excavation for new piping or its installation.

1.7. PLACEMENT OF EQUIPMENT AND WORK

A. The placement of substituted (approved equal) equipment in the locations shown on the drawings shall be the Contractors responsibility. The Contractor shall verify that all substituted equipment will fit, operate and have clearances and accessibility for maintenance, inspections, and operation within the space shown on the drawings. If the Contractor determines that substituted equipment will not fit and/or operate within the space shown on the Drawings and/or clearances and accessibility cannot be achieved, he shall bring these problems to the attention of the Architect who will make the final decision as to the method of correction. Corrections to work already completed and in-place shall not constitute an increase in the contract amount. The Contractor shall be responsible and incur any cost to allow for 36" clearance on two adjacent sides of equipment or on all sides if electrical access is required.

B. Move equipment and/or work into spaces through openings provided or located in the spaces during construction, as required.

C. Do disassembling and reassembling of equipment or other work necessary to accomplish this requirement without extra cost to the Owner. Do not disassemble or reassemble any equipment in order to locate it in the space.

1.8. MATERIAL LIST AND SUBSTITUTIONS

A. Comply with Supplementary General Conditions.

1.9. MAINTENANCE AND OPERATING INSTRUCTIONS

A. Comply with Section 01700.

B. Incorporate complete operating instructions including starting, stopping, and description of emergency manual operation methods for the following:

1. Heating Systems

2. Ventilating Systems

3. Air Conditioning Systems

4. Plumbing Systems

5. Provide charts and diagrams as required.

6. Provide operating manual for any equipment listed in individual sections of the specifications.

C. Provide maintenance instructions for each item of individual equipment covering pertinent maintenance data, such as lubricants to be used, frequency of lubrications, inspections required, adjustments, belt and pulley sizes, etc.

D. Provide parts bulletins containing manufacturer's bulletins with parts numbers, instructions, etc., for each item of equipment. Strip bulletins so that useless bulk is avoided.

E. Post service telephone numbers and/or addresses in an appropriate place as designated by the Architect.

PART 2 - PRODUCTS

2.1. MATERIALS AND EQUIPMENT

A. Mention herein or on Drawings requires that this Contractor provide each item listed of quality noted or acceptable equal. All material shall be new, full weight, standard in all respects, and in first-class condition. Provide materials of the same brand of manufacture throughout for each class of material or equipment where possible. Materials shall be tested within the Continental United States by independent, nationally recognized testing agency and shall be listed in accordance with testing agency requirements.

B. The grade or quality of materials desired is indicated by the trade names or catalog numbers stated herein. The catalog numbers and specification are for bidding purposes only. Actual equipment submitted and ordered shall be verified to be appropriate for indicated use.

C. Dimensions, sizes, and capacities shown are a minimum and shall not be changed without permissions of the Architect/Engineer.

2.2. MATERIALS FURNISHED

A. Identify all materials and equipment by manufacturer's name and model number. Remove unidentified materials and equipment from site.

B. Equipment specified by manufacturer's number shall include all accessories, controls, etc., listed in catalog as standard with equipment. Furnish optional or additional accessories as specified.

C. Equipment or material damaged during transportation, installation, or operation is considered as totally damaged. Replace with new equipment. Variance for this permitted only with written consent.

PART 3 - EXECUTION

3.1. DRAWINGS AND COORDINATION

A. General arrangement and location of piping, ductwork, equipment, etc., are shown on Drawings or herein specified. Careful examine other work that may conflict with this work. Install this work in harmony with other crafts and at proper time to avoid delay of work.

B. In advance of construction, work out minor changes and relocations to suit actual conditions and work of other trades to avoid conflict therewith. Any change in rerouting ductwork, piping and equipment shall not be cause for additional cost.

C. The Sub-Contractor shall verify that the measurement of constructed rooms, spaces and areas are as shown on the Drawings. Any measurement deviation and/or discrepancies shall be brought to the attention of the Architect who will make the final decision as to the method of correction. Corrections to work already completed and in place shall be done at the Contractor's expense.

D. In addition, obtain all necessary information from the other trades regarding centers of partitions, walls, location of plumbing mains, fire sprinkler mains, and electrical conduits, ducts, pipes, etc., in order that pipes equipment, and ductwork may be placed in their correct positions.

E. Execute any work or apparatus shown on the Drawings and not mentioned in the specifications, or vice versa, the same as if specifically mentioned by both. Omission from Drawings or specifications of any minor details of construction, installation, materials or essential specialties does not relieve this Contractor from furnishing same in place complete.

F. Furnish and install any incidental work not shown or specified which can reasonably be inferred as part of the work and necessary to provide a complete and workable system.

G. Furnish materials and work at proper time to avoid delay of the work.

3.2. CLOSING IN ON UNINSPECTED WORK

A. Do not allow or cause work installed to be covered up or enclosed before it has been inspected

and tested. Should work be enclosed or covered up before it has been inspected and tested, Contractor shall uncover work at own expense. After it has been inspected and tested, make repairs necessary to restore work of other Contractors to condition in which it was found at time of cutting.

3.3. PROJECT MODIFICATIONS

A. During the progress of construction, if such conditions arise that require revisions, modifications, or relocations to any mechanical equipment mechanical ductwork, mechanical piping, plumbing piping or materials incorporated in this project, such alterations shall be immediately called to the attention of the Architect. Contractor shall then prepare necessary Drawings showing proposed changes. Submit proposed changes for review to the Architect prior to actual revision of work in the field. There shall be no additional cost incurred for these changes.

B. Two (2) sets of Drawings showing all revisions shall be immediately presented to Architect for his records. Maintain additional copies on the project as necessary to comply with "RECORD DRAWINGS" requirement of the General Requirements.

C. Incorporate all revisions into record Drawings. These drawings shall be up to date at the end of every week and shall be available to Architect or Engineer at any time for inspection.

3.4. GUARANTEE

A. Be responsible for work done and material installed under these plans and specifications. Repair or replace, as may be necessary, any defective work, material, or part which may show itself within one (1) year of filing of Notice of Completion and be responsible for damage to other materials, furnishing, equipment, or premises caused by such defects during this period, if in the opinion of the Architect said defect is due to imperfection of material or workmanship. Provide all such work and materials at no cost to Owner.

B. Be responsible for damage to any part of premises during guarantee period caused by leaks or breaks in work furnished and/or installed under this section.

C. Replace refrigerant, lubricants, or gases lost as result of defects, breaks, or leaks in work.

3.5. RECORD DRAWINGS

A. Comply with Section 01700.

B. In addition, furnish one (1) tracing showing all outside utility connections, piping, etc., installed under this contract. Locate and dimension all work with reference to permanent landmarks.

C. Match all symbols and designations used in contract Drawings when preparing "Record" Drawings.

D. Indicate clearly and correctly all work installed differently from that shown, and maintain records up to date as work progresses. Include invert elevations of pipes below grade of floor, the floor lines, plugged wyes, tees, caps, exact locations and sizing or piping, location of valves, and the like. Dimension locations from structural points.

E. Properly identify all stubs for future connections as to locations and use by setting of concrete marker at finished grade in manner suitable to Architect.

3.6. MAINTENANCE DATA

A. Submit maintenance data and parts lists for all mechanical systems materials and products. Include product data, shop drawings, and Record Drawings in the maintenance manual all in allowance with the requirements of Division 1.

3.7. CLEANING UP

A. Comply with Supplementary General Conditions.

END OF SECTION 15010

SECTION 15045-MECHANICAL RELATED WORK

PART 1 - GENERAL

1.1. DESCRIPTION OF WORK

A. Extent of mechanical related work required by this section is indicated on drawings and schedules, and/or specified in other Division-15 sections.

B. Types of mechanical related work specified in this section include the following:

1. Access to Mechanical Work: Access doors in walls, ceilings, and floors. Removable cover plates in walls, ceilings, and floors.

2. Excavating for Mechanical Work: Underground mechanical piping and service trenches.

3. Concrete for Mechanical Work: Lean concrete backfill to support mechanical, encasement of mechanical work, underground structural concrete to accommodate mechanical work, mechanical equipment foundations and mounting pads, rough grouting in and around mechanical work, and patching concrete which has been cut to accommodate mechanical work. All free-standing mechanical equipment shall have a 4" thick minimum concrete pad and extend 6" out from equipment full perimeter.

1.2. QUALITY ASSURANCE

A. Access Units Fire Resistance Rating: Where fire resistance ratings are indicated for construction penetrated by access units, provide UL-listed and labeled units, except for units which are smaller than minimum size requiring ratings, as recognized by governing authority.

1.3. SUBMITTALS

A. Comply with Section 01300.

B. Product Data, Access Units: Submit manufacturer's data for each type access door assembly, including setting drawings, templates, instructions, and directions for installation of anchorage devices.

1.4. DELIVERY AND STORAGE

A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label.

1.5. PROJECT CONDITIONS

A. Existing Utilities: Locate and protect existing utilities and other underground work in manner which will ensure that no damage or service interruption will result from excavating and backfilling.

B. Protect property from damage which might result from excavating and backfilling.

C. Protect persons from injury at excavations by barricades, warnings, and illumination.

D. Where soil conditions vary with moisture conditions or runoff coordinate excavations with either conditions, to minimize possibility of washouts, settlements and other damages and hazards.

E. Provide temporary covering or enclosure and temporary heat as necessary to protect bottoms of excavations from freezing and frost action. Do not install mechanical work on frozen excavation bases or sub-bases.

PART 2 - PRODUCTS

2.1. ACCESS TO MECHANICAL WORK

A. Access Doors:

1. General: Where floors, walls, and ceilings must be penetrated for access to mechanical work provide types of access doors required, including floor doors if any. Furnish sizes indicated or, where not otherwise indicated, furnish adequate size for intended and necessary access or an 12" x 12" min. Furnish manufacturer's complete units, of type recommended for application in indicated substrate construction, in each case, complete with anchorages and hardware.

2. Access Door Construction: Except as otherwise indicated, fabricate wall/ceiling door units of welded steel construction with welds ground smooth; 16-gage frames and 14-gage flush panel doors, 175$^{o}$ swing with concealed spring hinges; flush screw-driver-operated cam lock; factory-applied rust inhibitive prime-coat paint finish.

3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering access doors which may be incorporated in the work include; but not limited to, the following:

a. Manufacturer: Subject to compliance with requirements, provide access doors of one of the following:

1) Milcor Div; Inryco, Inc., or acceptable equal.

B. Removable Access Plates:

1. General: Where control devices and similar elements of mechanical work are located within or behind wall, ceiling or floor construction of finishes, or below grade, and are not (cannot be) provided with integral removable access plates as specified in other Division-15 sections, provide removable access plates of types and sizes needed for access requirements, as indicated. Provide manufacturer's complete units with anchorages, fasteners and standard factory-applied finishes.

2. Wall/Ceiling Unit Construction: Except as otherwise indicated, and where adaptable to substrated, provide manufacturer's standard frameless round formed stainless steel or chrome-plated brass low-profile plate cover, with single exposed flush screw anchor, bright polished finish.

3. Painted Finish: Where substrate is indicated for painted finish, provide steel units with prime-coat paint finish.

4. Units Set at Grade: Except as otherwise indicated, provide manufacturer's standard round of square cast-iron units, complete with cast-iron pipe extension to protect mechanical element being accessed; designed to be set slightly above finish

grade, and to be either supported by compacted soil or be encase in concrete, secure plate to body with bronze screws, natural mill finish on plate and body.

C. Attic, Crawl Space, and Furred Space Access:

1. Provide access door as large as the largest piece of mechanical equipment, and in no case less than 22" x 36", into attic, crawl space or furred space. From the opening to the mechanical equipment there shall be a 24" wide pathway and it shall be solid and continuous. On all sides of mechanical equipment there shall be a level 30" minimum clear working space with a solid continuous platform.

2. Provide a permanent electric light outlet and light fixture, controlled by a switch located at the passageway opening. The light fixture shall be at or near the furnace.

2.2. MATERIALS OF CONCRETE WORK

A. Comply with Division 3.

2.3. CONDENSATE DRAIN PIPING

A. Auxiliary drain pans shall be installed under all evaporator coils or units containing evaporator coils, located in attic spaces, suspended ceiling spaces or furred spaces. Pans shall have a minimum depth of 1 ½ inch and shall be not less than 3 inches larger than unit or coil dimensions in width and length and shall be constructed of not less than 0.0276-inch (24 ga) galvanized sheet steel. A separate drain line shall be extended from this pan terminating at a conspicuous point to serve as an alarm that the regular drain is restricted. A float switch to control overflow may be used in emergency drain pan in lieu of a drain line, when approved by the mechanical official.

PART 3 - EXECUTION

3.1. ACCESS TO MECHANICAL WORK

A. Install access units where required or where conditions require, in accordance with manufacturer's written instructions, in compliance with recognized industry practices.

B. Coordinate with other work, include substrate construction work, as necessary to interface installation of access units with other work.

C. Locate each removable access unit accurately in relation to mechanical work requiring access.

D. Provide adequate temporary support or attachment to framing or formwork, that units will not be dislocated during construction of substrates.

E. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

F. Adjust hardware and panels after installation for proper operation.

G. Remove and replace panels or frames which are warped, boxed, or damaged.

3.2. EXCAVATING FOR MECHANICAL WORK

A. General: Do not excavate for mechanical work until the work is ready to proceed without delay, so that total time lapse from excavation to completion of backfilling will be minimized.

B. Excavate with vertical-sided excavations to greatest extend possible, except where otherwise indicated. Where necessary, provide sheeting and cross-bracing to sustain sides of excavations. Remove sheeting and cross-bracing during backfilling wherever such removal would not endanger the work or other property. Where not removed, cut sheeting off at sufficient distance below finished grade to not interfere with other work.

C. Depth for Direct Support: For work to be supported directly on undisturbed soil, do not excavate beyond indicated depths, and hand-excavate bottom cut to accurate elevations.

D. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.

E. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.

F. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

G. Excavation for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 6" to 9" clearance on both sides of pipe.

H. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.

I. Where rock is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone of gravel prior to installation of pipe.

J. Grade bottoms of trenches as indicated, notching under couplings to provide solid bearing for entire body of pipe.

K. Excavate near large trees (with drop-line) by hand, and protect the root system from damage or dry out to greatest extend possible. Maintain moist condition for root system and cover exposed roots with burlap. Paint root cuts of 1" diameter and larger with asphaltic tree paint.

## 3.3. BACKFILLING

A. General: Except as otherwise indicated, backfill with properly qualified backfill material.

B. Backfill with finely-graded sub-base material to 6" above wrapped, coated and plastic materials.

C. Condition backfill material by either drying or adding water uniformly, to whatever may be necessary to facilitate compaction to required densities. Do not backfill with frozen soil materials.

D. Back simultaneously on opposite sides of mechanical work, compact simultaneously; do not dislocate the work from installed positions.

E. Backfill excavations in 8" high courses of backfill material, uniformly compacted to the following densities (% of maximum density, ASTM D 1557), using power-driven hand-operated compaction equipment.

1. Lawn/Landscaped Areas: 85% for cohesive soils, 90% cohesionless soils.

2. Paved Areas, Other Than Roadways: 90% for cohesive soils; 95% for cohesionless soils.

3. Roadways: 90% for cohesive soils, 95% for cohesionless soils.

F. Backfill to elevations matching adjacent grades, at time of backfilling excavations for mechanical work.

G. Backfill trenches with concrete where trench excavations pass within 18" of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing.

H. Do not backfill trenches until tests and inspections have been made and backfilling authorized by Architect/Engineer. Use care in backfilling to avoid damage or displacement of pipe system.

I. Compaction Tests: Where compaction tests indicated lower densities of backfill than specified, continue compaction (and re-excavation and backfilling where necessary) and

provide additional testing as directed by Architect/Engineer. The allowable density tolerance is not more than one-test-out-of-5 falling more than two (2) percentage points below specified density.

END OF SECTION 15045

SECTION 15060-PIPE, TUBE, AND FITTINGS

PART 1 - GENERAL

1.1. SCOPE:

A. Extent of pipe, tube, and fittings required by this section is indicated on drawing and/or specified in other Division-15 Sections.

B. Types of pipes, tube, and pipe fittings specified in this section include the following:

1. Piping Materials: Copper tube, cast-iron soil pipe, plastic pipe and tubing.

2. Grooved piping products.

3. Miscellaneous piping materials/products.

4. Pipe, tube, and fittings furnished as part of factory-fabricated equipment, are specified as part of the equipment in other Division-15 sections.

1.2. QUALITY ASSURANCE

A. Welding: Comply with ASME Section 9 Procedures and Qualifications for shop and project site welding of piping work.

B. Brazing: Comply with procedures, braziers, and operators in accordance with ASME Section 9 for shop and job-site brazing of piping work. Braziers shall be certified with certificate on job site at all times.

1.3. SUBMITTALS

A. Comply with Section 01300. Submit catalog cuts, specifications and installation instructions for each type of pipe, tube, and fitting. Submit piping schedule showing manufacture, pipe or tube weight, fitting type, and joint type for each piping system. Provide one copy of each braziers certificate.

B. Maintenance Data: Submit maintenance data and parts lists for each type of mechanical fitting. Include this data, product data, and certifications and maintenance manual; in accordance with requirements of Division-1.

1.4. DELIVERY, STORAGE, AND HANDLING

A. Except for Hub-and-Spigot (A-74) and similar units of pipe, provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.

B. Where possible, store pipe and tube inside storage and enclosure, or by packaging with durable, waterproof wrapping.

PART 2 - PRODUCTS

2.1. PIPING AND FITTING MATERIALS

A. General: Provide pipe tube and fittings of type, joint type, grade, size and weight (wall thickness or class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with governing regulations and industry standards.

B. Copper Tube:

1. Copper Tube: ASTM B88; (wall thickness) as indicated for each service; hard-drawn temper, except as otherwise indicated.

2. DWV Copper Tube: ASTM B 306.

C. Fittings for Copper Tube:

1. Cast-Copper Solder Joint Fittings: ANSI B16.18.

2. Wrought-Copper Solder-Joint Fittings: ANSI B16.22.

3. Cast-Copper Solder-Joint Drainage Fittings: ANSI B16.23.

4. Wrought-Copper Solder-Joint Drawings Fittings: ANSI B16.29.

5. Cast-Copper Solder-Joint Drainage Fittings: For solvent drainage systems, ANSI B16.32.

6. Cast-Copper Flared Tube Fittings: ANSI B26.

7. Bronze Pipe Flanges/Fittings: ANSI B16.24.

8. Non-Ferrous Pipe Flanges: ANSI B16.24.

9. Copper-Tube Unions: Provide standard products recommended by manufacturer for use in service indicated.

D. Ductile-Iron Pipe: AWWA C151.

1. Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings: AWWA C104.

2. Polyethylene Encasement for Gray and Ductile Cast-Iron Piping: AWWA C105.

E. Cast-Iron Soil Pipe:

1. Hubless Cast-Iron Soil Pipe: C1SP!-301.

2. Cast-Iron Hub-and-Spigot Soil Pipe: ASTM a 74.

F. Fittings for Cast-Iron Soil Pipe:

1. Hubless Cast-Iron Soil Pipe Fittings: Neoprene gasket complying with ASTM C564; and stainless steel clamp holding band (C1SP1-310).

2. Cast-Iron Hub-and-Spigot Soil Pipe Fittings: Match soil pipe units; complying with same standards (ASTM A 74).

3. Compression Gaskets: ASTM C564.

4. Lead/Oakum Joint Materials: Provide products complying with governing regulations for use in service indicated.

G. Plastic Pipe (Shall not be used above ground or inside building):

1. Polyvinyl Chloride Pipe (PVC): ASTM D 2665.

2. AWWA C900 Pressure pipe for underground fire lines and water mains.

H. Fittings for Plastic Pipe:

1. PVC/CPVC Pipe Fittings: ASTM D 2464 for Schedule 80 threaded fittings: ASTM D 2466 for Schedule 40 socket-type; ASTM D 2467 for Schedule 80 socket-type; ASTM D 2564 for solvent cement; ASTM D 2665 for drain, waste, and vent.

I. Fittings for Plastic Tubing: Provide fittings of type indicated, matching tubing. Where not otherwise indicated, provide fittings produced and recommended, for service indicated, by manufacturer of tubing.

2.2. GROOVED PIPING PRODUCTS

A. General: At Installer's option and subject to local authorities approval, mechanical grooved pipe couplings and fittings may be used for piping systems having operating conditions not exceeding 230□F, excluding steam piping and any other service not recommended by manufacturer, in lieu of welded, flanged, or threaded methods, and may be used as unions, seismic joints, flexible connections, expansion joints, expansion compensators, or vibration reducers.

B. Coupling Housings: Malleable iron conforming to ASTM A 47 or ductile iron conforming to ASTM A 536.

C. Coupling Housing Description: Grooved mechanical type, which engages grooved or shouldered pipe ends, encasing an elastomeric gasket which bridges pipe ends to create seal. Cast in two or more parts, secure together during assembly with nuts and bolts. Permit degree of contraction and expansion as specified in manufacturer's latest published literature.

D. Gasket: Mechanical grooved coupling design, pressure responsive so that internal pressure serves to increase seal's tightness, constructed of elastomershaving properties as designated by ASTM D 2000.

1. Water Services: EDPM Grade E, with green color code identification.

2. Other Services: As recommended by Manufacturer.

E. Bolts and Nuts: Heat treated carbon steel ASTM A 183, minimum tensile 110,000 psi, at exposed locations use tamper resistant nuts.

F. Branch Stub-Ins: Upper housing with full locating collar for rigid positioning engaging machine-cut hole in pipe, encasing elastometric gasket conforming to pipe outside diameter around hole, and lower housing with positioning lugs, secured together during assembly with nuts and bolts.

G. Fittings: Grooved or shouldered end design to accept grooved mechanical couplings.

1. Malleable Iron: ASTM A 47.

2. Ductile Iron: ASTM A 536.

3. Fabricated Steel: ASTM A 53, Type F for 3/4" to 1-1/2"; Type E or S, Grade B for 2" to 20".

4. Steel: ASTM A 234.

H. Flanges: Conform to Class 125 cast iron and Class 150 steel bolt hole alignment.

1. Malleable Iron: ASTM A 47.

2. Ductile Iron: ASTM A 536.

I. Grooves:

1. Standard Steel: Square cut.

2. Lightweight Steel: Roll grooved.

3. Cast Iron: Radius cut grooved, AWWA C606.

J. Manufacturer: Victaulic Co. of America, ITT Grinnell Corp., Stockham Valves and Fittings, Inc.

2.3. MISCELLANEOUS PIPING MATERIALS/PRODUCTS

A. Welding Materials: Except as otherwise indicated, provide welding materials as determined by Installer to comply with installation requirements. Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.

B. Soldering Materials: Except as otherwise indicated, provide soldering materials as determined by Installer to comply with installation requirements.

C. Tin-Lead Solder: ASTM B 32, Grade 50A. (Limited to non-drinking water systems.)

D. Tin-Antimony Solder: ASTM B 32, Grade 95 TA.

E. Silver Solder: ASTM B 32, Grade 96.5 TS.

F. Domestic water system soldering materials shall contain no lead, cadmium, or toxic elements.

G. Brazing Materials: Except as otherwise indicated, provide brazing materials as determined by Installer to comply with installation requirements. Company with sfa-5-8, Section II ASME Boiler and Pressure Vessel Code for Brazing filler metal materials.

H. Gaskets for Flanged Joints: ANSI B16.21, full-faced for cast-iron flanges; raised-face for steel flanges, unless otherwise indicated.

I. Piping Connectors for Dissimilar Non-Pressure Pipe: Fernco, Inc., or acceptable equal; elastomeric annular ring insert, or elastomeric flexible coupling secured at each end with stainless steel clamps, sized for exact fit to pipe ends.

PART 3 - EXECUTION

3.1. INSTALLATION

A. General: Install pipe, tube and fittings in accordance with recognized industry practices which will achieve permanently leak-proof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Align piping accurately at connections, within 1/16" misalignment tolerance. Comply with ANSI B30 Code for

Pressure Piping. Piping installed by non-certified braziers or welders shall be deemed damaged and be replaced by all new material.

B. Locate piping runs, except as otherwise indicated, vertically and horizontal (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations, or if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent-enclosure elements of building; limit clearance to 1/2" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1.0" clearance outside insulation. Wherever possible in finishes and occupied spaces, conceal

piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.

C. Electrical Equipment Rooms: Do not run piping through transformer vaults and other electrical or electronic equipment rooms and enclosures unless unavoidable. Install drip pan under piping that must be run through electrical space.

D. Piping System Joints: Provide joints of type indicated in each piping system.

1. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe tape (Teflon) were recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.

2. Braze copper tube-and-fitting joints where indicated, in accordance with ANSI B31.5 and ASME Section 9. Cut tube end squarely to full inside diameter, and clean outside of tube ends and inside of fittings. Insert tube full depth into fitting, and braze such that brazing solder will be drawn full depth into fittings and full circle. Provide one Peal Test for every 25 joints.

3. Solder copper tube-and-fitting joints where indicated, in accordance with recognized industry practice. Cut tube end squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth into fitting, and solder in manner which will draw solder full depth and circumstances of joint. Wipe excess solder from joint before it hardens.

4. Mechanically Formed Tee Connections: In lieu of providing tee fittings in copper tubing, Installer may, as option, provide mechanically formed tee connections, providing they are in accordance with the following:

a. Size and wall thickness of both run tube and branch tube are listed by Manufacturer of forming equipment as "Acceptable Application".

b. Height of drawn collar is not less than 3 times wall thickness of run tubing.

c. End of branch tube is notched to conform to inner curve of run tube, and dimpled to set exact penetration depth into collar.

d. Resulting joint is minimum of 3 times as long as thickness of thinner joint member, and brazed using B-CuP series filler metal.

5. Mechanically Formed Couplings: In lieu of providing couplings in copper tubing, Installer may, as option provide mechanically formed couplings, provided they are in accordance with the following:

a. Form couplings by first annealing area at end of tube where expansion will occur. Insert tube expander to die size required and expand tube end to accept tubing of same size.

b. Resulting joint is minimum of 3 times as long as thickness of tube, and brazing using B-CuP series filler metal.

6. Weld pipe joints in accordance with recognized industry standard and as follows:

a. Weld pipe joints only when ambient temperature is above 0□F where possible. Bevel pipe ends at a 37.5 angle, smooth rough cuts, and clean to remove slag, metal particles and dirt.

b. Use pipe clamps or tack-weld joints with 1" long weld; 4 welds for pipe sizes to 10", 8 welds for pipe sizes 12" to 20".

c. Build up welds with stringer-bead pass, followed by cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedure which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions.

d. Do not weld-out piping system imperfections by tack-welding procedures; refabricate to comply with requirements.

e. At Installer's option, install forged branch-connection fittings wherever branch pipe of size smaller than main pipe is indicated; or install regular "T" fitting.

7. Weld pipe joints of steel water pipe in accordance with AWWA C206.

8. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flanges faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.

9. Lead Joint Installation: Tightly pack joint with joint packing material. Do not permit packing to enter bore of finished joint. Clean joint after packing. Fill remaining joint space with one pouring of lead to indicated minimum measured from face of bell. After lead has cooled, caulk joint tightly by use a hammer and caulking iron. Note: Lead joints shall only be allowed where permitted by local, state and county codes.

10. Hubless Cast-Iron Joints (C1SP1-310): Comply with Coupling Manufacturer installation instructions.

11. Plastic Pipe/Tube Joints: Comply with manufacturer's instructions and recommendations, and with applicable industry standards:

a. Heat joining of Thermoplastic Pipe: ASTM D 2657.

b. Making Solvent-Cemented joints: ASTM D 2235, and ASTM F 402.

12. Grooved Pipe Joints: Comply with manufacturer's instructions for making grooves in pipe ends. Remove burrs and ream pipe ends. Assemble joints in accordance with manufacturer's instructions.

E. Install drainage piping (perforated, porous or tile) from lowest end of slope to highest, solidly bedded in filtering or drainage and grooved ends of units up-stream. Lay perforated pipe with perforations down.

F. Install gray and ductile cast-iron water mains and appurtenances in accordance with AWWA C603.

3.2. CLEANING, FLUSHING, INSPECTING

A. General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion

of joints, supports and accessory items. Inspect pressure piping in accordance with procedures of ANSI B30.

B. Disinfect water mains and water service piping in accordance with AWWA C-651.

3.3. PIPING TESTS

A. Notify Architect/Engineer at least 24 hours before performing leak test. If Architect/Engineer is not notified in writing, test will be deemed null and void and performed over in Architect/Engineer presence at no extra cost to the Owner and the Contractor shall incur all Engineer's or Architect's cost.

B. Provide temporary equipment for testing, including pump and gauges. Test piping system before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurization for indicated pressure and time. Required test periods are 2 hours. Test each piping system at 150% of operating pressure indicated, but not less than 25 psi test pressure. Observe each test escution for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.

C. Repair piping systems sections which fail required piping test, by disassembling and re-installed, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.

D. Drain test water from piping systems after testing and repair work has been completed.

E. Refrigerant piping shall be tested at 300 psi for 24 hours with hydrogen and shall not have less than 5% drop in test pressure. Test shall be deemed null and void if test pressure exceeds 5% fall. Provide independent technician to perform test.

END OF SECTION 15060

SECTION 15082 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data for each type of plumbing insulation material.

B. Quality Assurance: Labeled with maximum flame-spread index of 25 and maximum smoke-developed index of 50 according to ASTM E 84.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

PART 3 - EXECUTION

3.1 PIPE INSULATION INSTALLATION

A. Comply with requirements of the Midwest Insulation Contractors Association's "National Commercial & Industrial Insulation Standards" for insulation installation on pipes and equipment.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall, Partition, and Floor Penetrations: Install insulation continuously through penetrations. Seal penetrations. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

D. Flexible Elastomeric Insulation Installation:

1. Seal longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

2. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.2 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot:

1. NPS 1-1/4 (DN 32) and Smaller: Insulation shall be the following:

a. Flexible Elastomeric: 3/4 inch (19 mm) thick.

END OF SECTION 15082

SECTION 15100-VALVES

PART 1 - GENERAL

1.1. SCOPE

A. Types of valves specified in this section include gate valves, globe valves, drain valves, ball valves, butterfly valves, and swing, check valves.

1.2. RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Valves furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division 15 sections.

1.3. QUALITY ASSURANCE

A. Marking of Valves: Comply with MSS SP-25.

B. Valve Dimensions: For face-to-face and end-to-end dimensions of flanged or welding-end valve bodies, comply with ANSI B16.10.

C. Valve Listing: For valves on fire protection piping, provide listing by UL.

D. Valves Installed in Boiler Rooms: Comply with ASME Boiler and Pressure Vessel Code where applicable.

E. Valve Types: Provide valves of same type by same manufacturer.

1.4. SUBMITTALS

A. Comply with Section 01300, Submittals.

B. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of valve. Include pressure drop curve or chart for each type and size of valve.

C. Maintenance Data: Submit maintenance data and spare parts lists for each type of valve.

PART 2 - PRODUCTS

2.1. VALVES

A. Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure rating indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.2. GATE VALVES

A. Crane Company, Valve Div.; Jenkins Brothers; Nibco, Inc.; Power (WM) Co.; Stockham Valves and Fittings, Inc., or Walworth Co.

B. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

C. Comply with the following standards:

1. Cast-Iron Valves: MSS SP-70.

2. Bronze Valves: MSS SP-80.

3. Steel Valves: ANSI B16.34.

D. For Domestic Water Service:

1. Threaded Ends 2" and Smaller: Class 125, bronze body, union bonnet, rising stem, solid wedge.

2. Flanged Ends 2-1/2" and Larger: Class 125, iron body, bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge.

3. Soldered Ends 2" and Smaller: Class 125, bronze body, screwed bonnet, nonrising stem, solid wedge.

2.3. GLOBE VALVES

A. Crane Co., Valve Div.; Jenkins Brothers; Nibco, Inc.; Powell (WM) Co.; Stockham Valves and Fittings, Inc.; or Walworth Co.

B. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects and packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

C. Composition Discs: Where required, provide suitable material for intended service. For stem throttling service, fit composition disc valve with throttling nut. For metal seated globe valves, provide hardened stainless steel disc and seat ring.

D. Comply with the following standards:

1. Cast-Iron Valves: MSS SP-85.

2. Bronze Valves: MSS SP-80.

3. Steel Valves: ANSI B16.34.

E. For Domestic Water Service:

1. Threaded Ends and Smaller: Class 150, bronze body, union bonnet, rising stem, composition disc.

2. Soldered Ends 2" and Smaller: Class 125, bronze body, screwed bonnet, rising stem, composition disc.

3. Flanged Ends 2-1/2" and Larger: Class 125, iron body, bolted bonnet, rising stem, OS&Y, renewable seat and disc.

2.4. DRAIN VALVES

A. Crane Co., Valve Div.; Jenkins Brothers; A Corp., or Walworth Co.

B. For Low Pressure Drainage Service:

1. Threaded Ends 2" and Smaller: Class 125, bronze body, screwed bonnet, rising stem, composition disc, 3/4" hose outlet connection.

2. Soldered Ends 2" and Smaller: Class 125, bronze body, screwed bonnet, rising stem composition disc, 3/4" hose outlet connection.

2.5. BALL VALVES

A. Select with port area equal to or greater than connection pipe area, include seat ring designed to hold sealing materials. Crane Co., Valve Div., Jamesbury Corp., Stockham Valves and Fittings, Inc., Walworth Co., and Victaulic.

B. Comply with the Following Standards:

1. Cast-Iron Valves: MSS SP-72.

2. Steel Valves: ANSI B16.34.

C. For Domestic Water Service:

1. Threaded Ends 2" and Smaller: Class 125, bronze 2-piece body, bronze ball, bronze stem.

2. Soldered Ends 2" and Smaller: Class 125, bronze 2-piece body, bronze ball, bronze stem.

2.6. BUTTERFLY VALVES

A. Comply with MSS SP-67. Provide only lug type valves. Provide gear operators on butterfly

valves 8" and larger. Acceptable manufacturers are Crane Co., Valve Div., Jamesbury Corp., Jenkins Bros., and Stockham Valves and Fittings, Inc.

B. For Domestic Water Service - Lug Type 3" and Larger: Class 150, ductile iron body, lever operated, cadmium plated ductile iron disc, Type 410 stainless steel stem, nitrile rubber seat.

2.7. SWING CHECK VALVES

A. Crane Co., Valve Div., Jenkins Bros., A Corp., Stockham Valves and Fittings, Inc., Walworth Co., and Victaulic.

B. Comply with MSS SP-71 for design, workmanship, material and testing.

C. Construct valves of pressure castings free of any impregnating materials. Construct valves of bronze, regrinding, with seating angle 40E and 45E, unless composition disc is specified.

D. Provide stop lug as renewable stop for disc hanger, unless otherwise specified. Construct disc and hanger as separated parts, with disc free to rotate. Support hanger pins on both ends by removable side plugs.

E. For Domestic Water Service:

1. Threaded Ends 2" and Smaller: Class 125, bronze body, screwed cap, horizontal swing, bronze disc.

2. Soldered Ends 2" and Smaller: Class 125, bronze body, screwed cap, horizontal swing, bronze disc.

3. Flanged Ends 2-1/2" and Larger: Class 125, iron body bronze mounted, bolted cap, horizontal swing, cast-iron disc.

2.8. VALVE FEATURES

A. Provide valves with features indicated, and where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1.

B. Bypass: Comply with MSS SP-45, and except as otherwise indicated, provide manufacturer's standard bypass piping and Valving.

C. Drain: Comply with MSS SP-45, and provide threaded pipe plugs complying with Section 15060.

D. Flanged: Valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 steel), or ANSI B16.24 (bronze).

E. Valve Ends:

1. Threaded: Comply with ANSI B2.1.

2. Butt Welding: Comply with ANSI B16.25.

3. Socket Welding: Comply with ANSI B16.11.

4. Solder Joints: Comply with ANSI B16.18.

F. Single Flange: Valves including bolt holes dimensioned for mating flanges.

G. Trim: Fabricate pressure-containing components of valve, including stems (shafts) and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing industry.

H. Non-Metallic Disc: Non-metallic material selected for service indicated in accordance with manufacturer's published literature.

I. Renewable Seat: Design seat of valve with removable disc, and assemble valve so disc can be replaced when worn.

J. Extended Stem: Increase stem length by 2" minimum, to accommodate insulation applied over valve.

K. Mechanical Actuator: Factory-fabricated gears, gear enclosure, external chain attachment and chain designed to provide mechanical advantage in operating valve.

L. Bonnet: Part of gate or globe valve through which stem passes to valve body, and attached to valve body by screws, bolts, union, or welding.

M. Solid Wedge: One-piece tapered disc in gate valve, designed for contact on both sides.

N. Double Disc: Two-piece tapered disc in gate valve, designed for contact on one side of each disc.

O. Parallel Double Disc: Two parallel disc in gate valve, designed for contact by action of separate wedging block.

P. Outside Screw and Yoke (OS&Y): Stem and handwheel designed to rise out of bonnet or yoke as valve operated from closed to open position.

Q. Tight Shutoff: Butterfly valve designed for flow regulation, and manufactured with minimum leakage in closed position.

R. Butterfly valves used for balancing shall be provided with lever lock, infinitely variable handles.

PART 3 - EXECUTION

3.1. INSTALLATION

A. Except as otherwise indicated, comply with the following requirements:

1. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.

2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward for horizontal plan unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.

B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.

C. Applications Subject to Shock: Install valves with bodies of metal other than cast iron where thermal or mechanical shock is indicated or can be expected to occur.

D. Applications Subject to Corrosion: Do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator. Install bronze valves in steam and condensate service and in other services where corrosion is indicated or can be expected or occur.

E. Mechanical Actuators: Install mechanical actuators with chain operators where indicated, and where valves 4" and larger are mounted more than 7'-0" above floor in mechanical rooms, boiler rooms, and where recommended by valve manufacturer because of valve size, pressure differential or other operating condition making manual operation difficult.

F. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections:

1. Tube Size 2" and Smaller: Soldered-joint valves.

2. Pipe Size 2" and Smaller: Threaded valves, grooved-end valves, butt-welding valves, socket-welding valves, flanged valves, flangeless valves, or single-flanged valves.

3. Pipe Size 2-1/2" and Larger: Grooved-end valves, butt-welding valves, socket-welding valves, flanged valves, wafer valves, single flange valves, hub-and-spigot valves, or mechanical joint end valves.

G. Valve System: Select and install valves with outside screw and yoke stems, except provide

inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.

H. Non-Metallic Disc: Limit selection and installation of valves with non-metallic disc to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.

I. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.

J. Fluid Control: Where throttling is indicated or recognized as principal reason for valve, install globe or butterfly valves.

K. Installation of Check Valves:

1. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.

END OF SECTION 15100

SECTION 15120-PIPING SPECIALTIES

PART 1 - GENERAL

1.1. DESCRIPTION OF WORK

A. Extent of piping specialties required by this section is indicated on drawings and/or specified in other Division 15 sections.

B. Types of piping specialties specified in this section include pipe escutcheons, pipelines strainers, dielectric unions, drip pans, sleeves, and sleeve seals.

1.2. RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Piping specialties furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division 15 sections.

1.3. SUBMITTALS: Comply with Section 01300.

A. Product Data: Submit catalog cuts, specifications, and installation instructions for each type of manufactured piping specialty. Include pressure drop curve or chart for each type and size of pipeline strainer. Submit schedule showing manufacturer's figure number, size, location, and features for each required piping specialty.

B. Shop Drawings: Submit for fabricated specialties, indicating details of fabrication, materials, and method of support.

C. Maintenance Data: Submit maintenance data and spare parts lists for each type of manufactured piping specialty. Include this data in Maintenance Manual.

PART 2 - PRODUCTS

2.1. MANUFACTURED PIPING SPECIALTIES

A. Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

B. Pipe Escutcheons: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls or ceilings; and pipe sleeve extension, of any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas. Chicago Specialty, Producers Specialty and Mfg. Corp., Sanitary Das Mfg. Co.

1. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.

2. Pipe Escutcheons for Dry Areas: Provide sheets steel escutcheons, solid or split hinged.

C. Y-Type Pipeline Strainers: Comply with FCI 73-1. Provide strainers full line size of connecting piping, with end matching piping system materials. Select strainers for 125 psi working pressure, with Type 304 stainless steel screens, with 3/64" perforations at 233 per sq. in. Armstrong Machine Works, Hoffman Specialty, Metroflex Co., Trane Co., Spirax Sarco Co., Div., White Consolidated, H.O. Trerice Co. Watts Regulator.

1. Threaded Ends, 2" and Smaller Cast Iron body, screwed screen retainer with centered blowdown fitted with pipe plug.

2. Threaded Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.

3. Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.

4. Butt Welded Ends, 2-1/2" and Larger: Scheduled 40 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.

D. Dielectric Unions: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductances), prevent galvanic action, and stop corrosion. B & K Industries, Capital Mfg. Co., Eclipse, Inc., EPCO Sales, Inc., Perfection Corp.

2.2. FABRICATED PIPING SPECIALTIES

A. Drip Pans: Provide drip pans fabricated from corrosion-resistant sheet metal with watertight joints, and with edges turned up 2-1/2". Reinforce top, either by structural angles or by rolling top over 1/4" steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection. Route drain line to nearest Janitorial sink or Mechanical Room floor drain.

B. Pipe Sleeves: Provide pipe sleeves of one of the following:

1. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snap lock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3" and smaller, 20 gauge; 4" to 6", 16 gauge; over 6", 14 gauge.

2. Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe, remove burrs.

4. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.

C. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:

1. Lead and Oakum: Caulked between sleeve and pipe. Note: Lead shall only be allowed where permitted by local, state, and county codes.

2. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation. Thunderline or acceptable equal.

D. Fire Barrier Penetration Seals: Provide seals for any opening through fire-rated or smoke-rated walls, floors, or ceilings used as passage for mechanical components such as piping or ductwork.

1. Cracks, Voids, or Holes up to 4" Diameter: Use putty or caulking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat, UL-listed.

2. Opening 4" or Greater: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E-814, consisting of wall warp or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350 degrees F (121 to 177 degrees C), UL-listed.

3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fire barrier penetration seals which may be incorporated in the work included; but are not limited to, the following:

a. Subject to compliance with requirements, provide fire barrier penetration seals of one of the following:

b. Electro Products Div./3M

Nelson; Unit of General Signal

PART 3 - EXECUTION

3.1. INSTALLATION OF MANUFACTURED PIPING SPECIALITIES

A. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration through floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and in flush with adjoining surface.

B. Y-Type Strainers: Install Y-Type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2" and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection. Locate Y-Type strainers in supply line ahead of pumps, steam raps serving steam main drips, temperature control valves, pressure reducing valves, temperature or pressure regulating valves, and elsewhere as indicated, if integral strainer is not included in equipment.

C. Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.

3.2. INSTALLATION OF FABRICATED PIPING SPECIALTIES

A. Locate drip pans under piping passing over or within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang form structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1" drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.

B. Locate drip pans under all horizontal hung air conditioning units. All sides will extend at least 2" beyond any surfaces of unit or piping appurtenances subject to forming condensate.

C. Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves 1/4" above level floor finish, and 3/4" above floor finish sloped to drain. Comply with NFPA 13 for

special requirements of floor sleeve extension in rooms contacting sprinklers. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves. Install Sheet-Metal sleeves at interior partitions and ceilings other than suspended ceilings. Install Iron-Pipe sleeves at exterior penetrations, both above and below grade.

D. Sleeve Seals: Install in accordance with the following:

1. Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.

END OF SECTION 15120

 

SECTION 15130-SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1. DESCRIPTION OF WORK

A. Extend of support and anchors, specified in this section is indicated on drawings and/or specified in other Division 15 sections.

B. Types of supports and anchors specified in this section include horizontal-piping hangers and supports, Vertical-Piping clamps, hanger-rod attachments, building attachments, saddles and shields, flashing materials, miscellaneous materials, and equipment supports.

C. Concrete housekeeping bases; work of this Section.

1.2. QUALITY ASSURANCE

A. Code Compliance: Comply with applicable codes pertaining to product materials and installation of supports, anchors.

B. UL Compliance: Provide products which are Underwriters Laboratories listed.

C. Manufacturer's Standard Society of the Valve and Fitting Industry, Inc., (MSS) Standard Compliance:

1. Provide pipe hangers and supports of which materials, design, and manufacturer comply with MSS SP-58.

2. Select and apply pipe hangers and supports, complying with MSS SP-69.

3. Fabricate and install pipe hangers and supports, complying with MSS SP-89.

4. Terminology used in this section is defined in MSS SP-90.

1.3. SUBMITTALS

A. Comply with Section 01300. Submit catalog cuts, specifications, installation and instructions for each type of support, anchor, and seal.

PART 2 - PRODUCTS

2.1. HORIZONTAL - PIPING HANGERS AND SUPPORTS

A. Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or

shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.

1. Adjustable Steel Clevises: MSS Type 1.

2. Yoke Type Pipe Clamps: MSS Type 2.

3. Steel Double Bolt Pipe Clamps: MSS Type 3.

4. Steel Pipe Clamps: MSS Type 4.

5. Pipe Hangers: MSS Type 5.

6. Adjustable Swivel Pipe Rings: MSS Type 6.

7. Adjustable Steel Band Hangers: MSS Type 7.

8. Adjustable Band Hangers: MSS Type 9

9. Adjustable Swivel Rings, Band Type: MSS Type 10.

10. Split Pipe Rings: MSS Type 11.

11. Extension Split Pipe Clamps: MSS Type 12.

12. U-Bolt: MSS Type 24.

13. Clips: MSS Type 26.

14. Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast-iron floor flange.

15. Adjustable Pipe Saddle Supports: MSS Type 38, including steel pipe base support and cast-iron floor flange.

16. Vertical-Piping Clamps: Except as otherwise indicated, provide factory-fabricated Vertical-Piping clamps complying with MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.

17. Two-Bolt Riser Clamps: MSS Type 8.

## 2.2. HANGER-ROD ATTACHMENTS

A. Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-8, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hangers rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

1. Steel Turnbuckles: MSS Type 13.

2. Steel Clevices: MSS Type 14.

3. Swivel Turnbuckles: MSS Type 15.

4. Malleable Iron Sockets: MSS Type 16.

5. Steel Weldless Eye Nuts: MSS Type 17.

2.3. BUILDING ATTACHMENTS

A. Except as otherwise indicated, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-9 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.

1. Top Beam C-Clamps: MSS Type 19.

2. Side Beam or Channel Clamps: MSS Type 20.

3. Center Beam Clamps: MSS Type 21.

4. Welded Attachments: MSS Type 22.

5. C-Clamps: MSS Type 23.

6. Top I-Beam Clamps: MSS Type 25.

7. Side-Beam Clamps: MSS Type 27.

8. Steel I-Beam Clamps W/Eye Nut: MSS Type 28.

9. Steel WF-Beam Clamps W/Eye Nut: MSS Type 29.

10. Malleable Beam Clamps: MSS Type 30.

11. Steel Brackets: One of the following for indicated loading:

a. Light Duty: MSS Type 31.

b. Medium Duty: MSS Type 32.

12. Side Beam Brackets: MSS Type 34.

13. Plate Lugs: MSS Type 34.

## 2.4. SADDLES AND SHIELD

A. Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shield for exact fit to mate with pipe insulation. Elcen Metal Products Co., or Pipe Shields, Inc.

B. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.

C. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.

## 2.5. FLASHING MATERIALS

A. Furnish flashings for each penetration of mechanical systems through roofs or waterproof membranes to Contractor responsible for installation of flashings.

B. Copper Flashing: Provide cold-rolled sheet copper, complying with ASTM B 370, weighing 16 oz., per sq. ft. (0.0216" thick), except as otherwise indicated.

C. Lead-Coated Copper Flashing: Provide cold-rolled sheet copper (ASTM 370), of proper temper for applications shown and required forming; coated on one side with not less than 0.06 lbs. per sq. ft. of lead (ASTM B 101, Type I, Class A); weighing 1.06 lbs. per sq. ft., except as otherwise indicated.

D. Lead Flashing: Provide sheet lead complying with FS QQ-L-201, Grade B; formed from common desilverized pig lead, complying with ASTM B 29; weighing 4.0 lbs. per sq. ft., except as otherwise indicated.

E. Bituminous Coating: FS TT-C-494, or MIL-C-18480, or SSPC-Paint 12, cold-applied solvent-type bituminous mastic coating for application in dry film thickness of 15 mils per coat.

F. Laminated Sheet Flashing: Bottom laminate of heavy-duty non-plasticized chlorinated polyethylene (CPE) synthetic elastomer, with top laminate of built-up roofing (BUR) sheet material; weight 8 oz. per sq. ft.

## 2.6. MISCELLANEOUS MATERIALS

A. Metal Framing: Provide products complying with NEMA STD ML 1.

B. Steel Plates, Shapes, and Bars: Provide products complying with ASTM A 36.

C. Cement Grout: Portland Cement (ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

# PART 3 - EXECUTION

## 3.1. PREPARATION

A. Proceed with installation of hangers supports and anchors only after required building structural work has been completed in areas where the work is to installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.

## 3.2. INSTALLATION OF HANGERS AND SUPPORTS

A. Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-9. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

B. Install hangers and supports complete with necessary bolts, rods, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

C. Support fire-water piping independently of other piping.

D. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

E. Provisions for Movement:

1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion bends and similar units.

2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

3. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.

F. Insulated Piping: Comply with the following installation requirements:

1. Clamps: Attach clamps, including spacers (if any), to piping with clamps over insulated pipe; protect pipe with metal ring. Do not exceed pipe stresses allowed by ANSI B31.

2. Saddles: Where insulated is indicated, install protection saddles.

G. Rod Stiffeners: Provide hanger rod stiffeners for all rods over 36" in length, and per local, state, or county code.

## 3.3. ADJUSTMENT OF HANGERS AND SUPPORTS

A. Adjust hangers and supports and place grout as required under supports to bring piping to proper levels and elevations.

## 3.4. EQUIPMENT BASES

A. For all floor-mounted equipment furnished as part of the work of Division 15. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation unless otherwise indicated. Construct of reinforced concrete in compliance with Section 03310. Rough-in floor slab beneath base for bond, and provide steel rod anchors between floor base. Locate anchor bolts using equipment manufacturer's templates. Chamfer to and edge corners. Perform necessary layout work in space provided for the equipment and confirm clearance from all floor drains, doors and other equipment and access clearance for maintenance as required by the manufacturer by the governing code authority, whichever is most restrictive. Notify the Architect of any conflicts before beginning construction.

B. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands.

C. Furnish roof equipment supports to contractor for installation as part of work of Division 7; not work of this section.

## 3.5. ADJUSTING AND CLEANING

A. Hanger Adjustment: Adjust hangers so as to distribute loads equally on attachments.

B. Support Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.

C. Clean Factory-Finished Surfaces: Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 15140

SECTION 15135-METERS AND GAUGES

PART 1 - GENERAL

1.1. DESCRIPTION OF WORK

A. Extent of meters required by this section is indicated on drawings and/or specified in other Division 15 sections.

B. Types of meters and gauges specified in this section include the following:

1. Temperature Gauges and Fittings: Glass thermometers, thermometer wells, and temperature gauge connector plugs.

2. Pressure Gauges and Fittings: Pressure gauges, pressure gauge cocks, and pressure gauge connector plugs.

3. Flow Measuring Calibrated Balancing Valve Gauges: Wafer type flow meters, pressure compensating flow control valve, and flow measuring instrument.

1.2. QUALITY ASSURANCE

A. UL Compliance: Comply with applicable UL standard pertaining to meters and gauges.

B. ANSI and ISA Compliance's: Comply with applicable portions of ANSI and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gauges.

C. Certification: Provide meters and gauges whose accuracy's, under specified operating conditions, are certified by manufacturer.

1.3. SUBMITTALS: Comply with Section 01300.

A. Product Data: Submit catalog cuts, specifications, installation, and instructions for each type of meter and gauge. Include scale range ratings, and calibrated performance curves, certified where indicated. Submit meter and gauge schedule showing manufacturer's figure number scale range, location, and accessories for each meter and gauge.

B. Maintenance: Submit maintenance data and spare parts lists for each type of meter and gauge. Include this data in Maintenance Manual.

PART 2 - PRODUCTS

2.1. TEMPERATURE GAUGES

A. Glass Thermometers: Provide glass thermometers of materials, capacities, and ranges indicated, designed and constructed for use in service indicated. Ernst Gage Co., Marshalltown Instruments, H.O. Trerice Co., or Weiss Instruments, Inc.

1. Case: Die cast aluminum finished in baked epoxy enamel, glass front, spring secured, 9" long.

2. Adjustable Joint: Die cast aluminum, finished to match case, 180□ adjustment in vertical plan, 360□ adjustment in horizontal plan, with locking device.

3. Tube and Capillary: Mercury filled, magnifying lens, 1% scale range accuracy, shock mounted.

4. Scale: Satin faced, non-reflective aluminum, permanently etched markings.

5. Stem: Copper-plated steel, or brass, for separable socket, length to suit installation.

6. Range: Conform to the following:

a. Hot Water: 30□ - 240□ with 2□F scale divisions.

7. Chilled Water: 30□ - 180□F with 2□F scale divisions.

B. Thermometer Wells: Provide thermometer wells constructed of brass or stainless steel, pressure rated to match piping system design pressure. Provide 2" extension for insulated piping. Provide cap nut with chain fastened permanently to thermometer well. Provide thermometer wells by the same manufacturer as thermometer.

C. Temperature Gauge Connector Plugs: Provide temperature gauge connector plugs pressure rated for 500 psi and 200□F. Construct of brass and finish in nickel-plate, equip with 1/2" NPT fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8" O.D. probe assembly to insulation thickness, for insulated piping. Peterson Equipment Company.

2.2. PRESSURE GAUGE AND FITTING

A. Pressure Gauges: Provide pressure gauges of materials capacities, and ranges indicated, designed and constructed for use in service indicated. Marsh Instrument Co., Unit of General Signal, Marshalltown Instruments, Inc., H.O. Trerice Co., or Weiss Instruments, Inc.

1. Type: General use, 1% accuracy, ANSI B40.1 grade A phosphor bronze bourdon type, bottom connection.

2. Case: Drawn steel or brass, glass lens, 4-1/2" diameter.

3. Connector: Brass with 1/4" male NPT. Provide coil siphon when used for steam service. Provide one or more snubbers on all lines where sudden pressure changes are noticeable.

4. Scale: White coated aluminum, with permanently etched markings.

5. Range: Conform to the following:

a. Vacuum: 30" hg - 15 psi.

b. Water: 0 - 100 psi.

c. Steam: 0 - 200 psi.

B. Pressure Gauge Cocks: Provide pressure gauge cocks between pressure gauges and gauge tees on piping systems. Construct gauge cock of brass with 1/4' female NPT on each end, and "T" handle brass plug. Provide pressure gauge cocks by same manufacturer as pressure gauges.

C. Pressure Gauge Connector Plugs: Provide pressure gauge connector plugs pressure rate for 500 psi and 200 F. Construct of brass and finish in nickel-plate, equip with 1/2" NPT fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8" O.D. probe assembly from dial type insertion pressure gauge. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness, for insulted piping. Peterson Equipment Company.

2.3. FLOW MEASURE GAUGES

A. Wafer-Type Flow Meters: Provide as indicated, cast-iron Wafer-type flow meters equipped with readout valves to facilitate connecting of differential pressure meter to flow meter. Equip each readout valve with integral EPT check valve designed to minimize system fluid loss

 

during monitoring process. Provide calibrated nameplate with flow meter detailing its flow range through range of differential head pressure. Bell & Gossett, ITT Fluid Handling Company, or acceptable equal.

B. Calibrated Balance Valves: Provide as indicated, calibrated balance valves equipped with readout valves to facilitate connecting of differential pressure meter to balance valves. Equip each readout valve with integral EPT check valve designed to minimize system fluid loss during monitoring process. Provide calibrated nameplate to indicated degree of closure of precision machine orifice. Construct balancing valve with internal EPT o-rings seals to prevent leakage around rotating element. Provide balance valves with pre-formed polyurethane insulation suitable for use on heating and cooling systems, and to protect balance valves during shipment. Bell & Gossett, ITT Fluid Handling Division, TACO, Inc., or Thrush Products, Inc.

C. Pressure Compensating Flow Control Valve: Provide factory control valve calibrated, directed acting, automatic pressure compensating type. Each valve to limit flow rates to within +5% accuracy, regardless of system pressure fluctuations. Valve control mechanism to consist of a tamperproof, stainless steel cartridge assembly with open chambers and unobstructed flow passages. Include a self-cleaning, spring-loaded moving cup cartridge assembly guided at two separate points. Provide four differential pressure ranges with the minimum range requiring less than 2 psid. Each valve to be provided with a metal tag, chain and stamped for system identification. Provide pressure taps and quick disconnect valve with ferrous bodies. Griswold Controls Mfg. Company.

D. Flow Measuring Instrument: Provide a portable flow measuring apparatus, complete with carrying case, pressure gauge, all necessary valves, hoses and connections. Unit to be compatible with gauges or flow control valves to indicate pressure differential to determine flow rate. Provide flow measuring instrument by same manufacturer as gauge or valve. Turn over instrument to Owner testing work is completed.

## PART 3 - EXECUTION

### 3.1. INSTALLATION OF TEMPERATURE GAUGES

A. Install temperature gauges in vertical upright position, and tilted so as to be easily read by observer standing on floor.

1. Locations: Install where indicated or on inlet and outlet side of equipment.

2. Thermometer Wells: Install for all thermometers in piping tee where at thermometers and where indicated, in vertical upright position. Fill well with oil or graphite, secure cap.

3. Temperature Gauge Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

### 3.2. INSTALLATION OF PRESSURE GAUGES

A. Install pressure gauges in piping tee with pressure gauge cock, located on pipe at most readable position.

1. Locations: Install at suction and discharge of each hydronic pump, at discharge or each pressure reducing valve, at water service outlet, at inlet and outlet of water cooled condenser and elsewhere as indicated.

2. Pressure Gauge Cocks: Install in piping tee with snubber. Install siphon for steam pressure gauges.

3. Pressure Gauge Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

## 3.3. INSTALLATION OF FLOW MEASURING GAUGES

A. Install flow measuring gauges on piping systems located in accessible locations at most readable position.

1. Locations: Install at inlet of each hydronic coil and cooling tower and elsewhere as indicated.

2. Wafer-type Flow Meters: Install between 2 Class 125 pipe flanges, ANSI B16.1 (cast-iron) ANSI B16.24 (cast-bronze). Provide minimum straight lengths of pipe upstream and down stream from meter in accordance with Manufacturer's installation instructions.

3. Calibrated Balance Valves: Install on piping with readout valves in vertical upright position. Maintain length of straight unrestricted piping equivalent to 3 pipe diameters upstream of valve.

4. Pressure Compensating Flow Control Valve: Install in accordance with manufacturer's installation instructions.

## 3.4. ADJUSTING AND CLEANING

A. Adjust faces of meters and gauges to proper angle for best visibility.

B. Cleaning: Clean windows of meters and gauges and factory-finished surfaces. Replace cracked or broken windows, repair any scratched or marred surfaces with manufacturer's touch-up paint.

END OF SECTION 15135

SECTION 15140 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Performance Requirements: Provide components and installation capable of producing domestic water piping systems with 80 psig (550 kPa) unless otherwise indicated.

B. Comply with NSF 14, "Plastics Piping System Components and Related Materials," for plastic piping and components. Include marking "NSF-pw" on piping.

C. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Steel Piping: ASTM A 53/A 53M, Schedule 40, galvanized-steel pipe, with ASME B16.4, Class 125, galvanized, standard pattern gray-iron, threaded fittings.

B. Soft Copper Tubing: ASTM B 88, Types K and L (ASTM B 88M, Types A and B), water tube, annealed temper with copper pressure fittings, cast-copper-alloy or wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

1. Joining Materials: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder.

C. Hard Copper Tubing: ASTM B 88, Types L and M (ASTM B 88M, Types B and C), water tube, drawn temper with wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

1. Copper Unions: Cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

2. Joining Materials: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder.

D. CPVC Piping: ASTM F 441/F 441M, Schedule 40 pipe with ASTM F 438, CPVC Schedule 40 socket-type fittings.

E. PEX Piping: ASTM F 877, SDR 9 PEX tube and ASTM F 1807, metal insert-type fittings with copper crimp rings.

1. Manifold: ASTM F 877, with a valve for each outlet.

F. PVC Schedule 40 Pipe: ASTM D 1785.

1. PVC Schedule 40 Fittings: ASTM D 2466, socket type.

## PART 3 - EXECUTION

### 3.1 INSTALLATIONS

A. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for wall penetration systems.

B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for drain valves, strainers, and pressure gages.

C. Install domestic water piping with 0.25 percent slope downward toward drain for horizontal piping and plumb for vertical piping.

D. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

E. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for basic piping joint construction.

1. Soldered Joints: Comply with procedures in ASTM B 828 unless otherwise indicated.

F. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for pipe hanger and support devices.

G. Support vertical piping at each floor.

### 3.2 INSPECTING AND CLEANING

A. Inspect and test piping systems as follows:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

B. Clean and disinfect water distribution piping by filling system with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

### 3.3 PIPING SCHEDULE

A. Underground, Service Entrance Piping: Schedule 80 PVC piping.

B. Aboveground Distribution Piping: Type L (Type B) hard copper tubing Type M (Type C), hard copper tubing CPVC piping, or Schedule 40 PVC piping.

3.4 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.

2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.

3. Hot-Water-Piping, Balancing Duty: Memory-stop balancing valves.

4. Drain Duty: Hose-end drain valves.

B. Install gate valves close to main on each branch and riser serving two or more plumbing fixtures or equipment connections and where indicated.

C. Install gate or ball valves on inlet to each plumbing equipment item, on each supply to each plumbing fixture not having stops on supplies, and elsewhere as indicated.

D. CPVC and PVC ball, butterfly, and check valves may be used in matching piping materials.

E. Install drain valve at base of each riser, at low points of horizontal runs, and where required to drain water distribution piping system.

F. Install swing check valve on discharge side of each pump and elsewhere as indicated.

G. Install ball valves in each hot-water circulating loop and discharge side of each pump.

END OF SECTION 15140

SECTION 15150 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Minimum Pressure Requirement for Soil, Waste, and Vent: 10-foot head of water (30 kPa).

B. Comply with NSF 14, "Plastic Piping Components and Related Materials," for plastic piping components.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

A. Copper Drainage Tube and Fittings: ASTM B 306, Type DWV drawn temper with cast-copper, Type DWV drainage fittings.

B. Hub-and-Spigot Cast-Iron Soil Pipe and Fittings: ASTM A 74, Service class; ASTM C 564 rubber gaskets.

C. Hubless Cast-Iron Soil Pipe and Fittings: ASTM A 888 or CISPI 301, with ASTM C 1277 shielded couplings.

D. PVC Plastic, DWV Pipe and Fittings: ASTM D 2665, Schedule 40, plain ends with PVC socket-type, DWV pipe fittings.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for basic piping installation requirements.

B. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

C. Install wall penetration system at each pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for wall penetration systems.

1. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

D. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

E. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

F. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.

2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.

3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

G. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

H. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

I. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

J. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for basic piping joint construction.

K. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure unless otherwise indicated.

L. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for pipe hanger and support devices.

3.2 PIPE SCHEDULE

A. Aboveground Applications: PVC plastic, DWV pipe and fittings with solvent-cemented joints Copper drainage tube and fittings with soldered joints.

B. Belowground Applications: PVC plastic, DWV pipe and drainage-pattern fittings with cemented joints.

END OF SECTION 15150

SECTION 15155 - DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Cleanouts,:

1. Application: Floor cleanout Wall cleanout.

2. Body or Ferrule Material: Plastic.

3. Clamping Device: Required.

4. Outlet Connection: Threaded.

5. Closure: Plastic plug.

6. Adjustable Housing Material: Plastic with set-screws or other device.

B. Floor Drains,:

1. Application: Floor drain.

2. Body Material: Gray iron.

3. Seepage Flange: Required.

4. Clamping Device: Required.

5. Outlet: Bottom.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

B. Install floor drains at low pints of surface areas and where indicated. Set tops of drains flush with finished floor.

1. Trap drains connected to sanitary building drain.

2. Install drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes.

END OF SECTION 15155

SECTION 15160 - STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Summary: This Section includes storm drainage piping inside the building.

B. Minimum Pressure Requirement for Storm Drainage: 10-foot head of water (30 kPa).

C. Comply with NSF 14, "Plastic Piping Components and Related Materials," for plastic piping components.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

A. Copper Drainage Tube and Fittings: ASTM B 306, Type DWV drawn temper with ASME B16.23, cast-copper, solder-joint fittings.

B. Hub-and-Spigot Cast-Iron Soil Pipe and Fittings: ASTM A 74, Service class; ASTM C 564, rubber gaskets.

C. Hubless Cast-Iron Soil Pipe and Fittings: ASTM A 888 or CISPI 301 with ASTM C 1277 shielded couplings.

D. PVC Plastic, DWV Pipe and Fittings: ASTM D 2665, Schedule 40, with PVC socket type fittings made to ASTM D 3311, drain, waste, and vent patterns.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for basic piping installation requirements.

B. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

C. Install wall penetration system at each pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for wall penetration systems.

1. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

 

D. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

E. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

F. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.

2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

G. Install PVC storm drainage piping according to ASTM D 2665.

H. Install underground PVC storm drainage piping according to ASTM D 2321.

I. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

J. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for basic piping joint construction.

K. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

L. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for pipe hanger and support devices.

3.2 INSPECTION

A. Inspect and test piping systems following procedures of authorities having jurisdiction.

3.3 PIPE SCHEDULE

A. Aboveground Applications: PVC plastic, DWV pipe and fittings with solvent-cemented joints Copper drainage tube and fittings with soldered joints.

B. Belowground Applications: PVC plastic, DWV pipe and fittings with solvent-cemented joints.

END OF SECTION 15160

SECTION 15210-VIBRATION ISOLATION

PART 1 - GENERAL

1.1. DESCRIPTION OF WORK

A. Extent of vibration isolation work required by this section is indicated on drawings and schedules, and/or specified in other Division 15 sections.

B. Types of vibration isolation products specified in this section include isolation hangers, and flexible pipe connectors, pump isolators and cooling tower isolators.

1.2. RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Vibration isolation products furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division 15 sections.

1.3. QUALITY ASSURANCE

A. Code Compliance: Comply with applicable codes pertaining to product materials and installation.

1.4. SUBMITTALS

A. Comply with Section 01300.

B. Product Data: Submit manufacturer's specifications, detailed drawings, performance characteristics data and installation instructions for each type of unit required.

1. Include data for each type and size of unit, showing isolation efficiency, stiffness, natural frequency and transmissibility at lowest operating speed of equipment.

C. Shop Drawings:

1. Submit shop drawings showing structural design and details of inertia bases, steel beam bases and other custom-fabricated work not covered by manufacturer's submitted data.

2. Submit shop drawings indicating scope of vibrating isolation work and locations of units and flexible connections. Include support isolation points for piping and ductwork.

PART 2 - PRODUCTS

2.1. ISOLATION MATERIALS AND SUPPORT UNITS

A. Amber Booth Corp., or acceptable equal.

B. Isolation Hangers: Hanger units formed with brackets and including manufacturer's standard compression isolators of type indicated. Design brackets for 5 times rated

loading of units. Fabricate units to accept misalignment of suspension members, and for use with either rod or strap type members, and including acoustical washers to prevent metal-to-metal contacts. Provide vibration isolation spring with cap and pad-type isolator, securely retained in unit. Provide neoprene pad, securely retained in unit.

C. Flexible Pipe Connectors:

1. For non-ferrous piping, provide bronze hose covered with bronze wire braid with copper tube ends or bronze flanged ends, braze-welded to hose (Type BR).

2. For ferrous piping, provide stainless steel hose covered with stainless steel wire braid with NPT steel nipples or 150 psi ANSI flanges, welded to hose (Type SS).

3. Rubber Flexible Pipe Connectors: Provide of rubber and butyl construction with integral full-faced duck and butyl flanges, internally steel wire reinforced, with furnished complete with steel retainage rings. Select with temperature and pressure ratings to suit intended service (Type RS).

## PART 3 - EXECUTION

### 3.1. PERFORMANCE OF ISOLATORS

A. General: Comply with minimum static deflections recommended by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, including definitions of critical and non-critical locations, for selection and application of vibration isolation material and unit is indicated.

B. Manufacturer's Recommendations: Except as otherwise indicated, comply with manufacturer's recommendations for selection and application of vibration isolation materials and units.

### 3.2. APPLICATIONS

A. Except as otherwise indicated, apply the following types of vibration isolators at indicated locations or for indicated items of equipment. Selection is Installer's option where more than one type is indicated.

B. Isolation Hangers: Install where ceiling hung air-handling-units are located, pipe over 1" pipe size, located in mechanical equipment rooms, and each run connected to vibration-isolation-mounted equipment for a distance of 100 diameters but not less then 50'- 0".

C. Flexible Pipe Connectors: Install in piping systems at connections, 3/4" pipe size and larger, with vibration-isolation-mounted equipment and elsewhere as indicated.

### 3.3. INSTALLATION

A. Except as otherwise indicated, comply with manufacturer's instructions for installation and load application to vibration isolation materials and units. Adjust to ensure that units do not exceed rated operating deflections or bottom out under loading, and are not short-circuited by other contacts or bearing points. Remove space blocks and similar devices (if any) intended for temporary protection against overloading during installation.

B. Anchor and attach units to substrate and equipment as required for secure operation and to prevent displacement by normal forces, and as indicated.

C. Locate isolation hangers as near overhead support structure as possible.

### 3.4. EXAMINATION OR RELATED WORK

A. Installer of vibration isolation work shall observe installation of other work related to vibration isolation work, including work connected to vibration isolation work; and, after completion of other related work (but before equipment startup).

B. Do not start up equipment until inadequacies have been corrected in manner acceptable to vibration isolation Installer.

END OF SECTION 15210

SECTION 15410 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data for each type of plumbing fixture, including trim, fittings, accessories, appliances, appurtenances, equipment, and supports.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components - Health Effects," for fixture materials that will be in contact with potable water.

PART 2 - PRODUCTS

2.1 WATER CLOSET

A. Vitreous-China Water Closet: Elongated, siphon-jet type, floor-mounted, floor floor-mounted, back outlet with close-coupled, gravity-type tank one-piece bowl and tank.

1. Design Consumption: 1.6 gal./flush (6 L/flush).

B. Toilet Seat: Elongated, solid plastic closed front with cover with bumpers and hardware, Residential class.

C. Fixture Support: Combination carrier designed for accessible mounting height. Include additional faceplate and coupling for water closet at wide pipe space. Compact-type carrier for back-to-back water-closet installation is prohibited.

2.2 LAVATORY

A. Vitreous-China Lavatory: Accessible, wall-mounting,.

B. Faucets: ASME A112.18.1; solid-brass underbody and brass cover plate.

1. Type: Center set with central inlets and without pop-up waste.

2. Finish: Polished chrome-plate.

3. Handle(s): Dual, 4-inch (102-mm) wrist blade.

4. Maximum Flow Rate: 2.2 gpm (8.3 L/min.).

C. Drain: Grid strainer with NPS 1-1/4 (DN 32) tailpiece.

D. Trap: Chrome-plated, and plastic tubular fittings with slip-joint inlet and wall flange.

E. Supply and Drain Insulation: Soft-plastic covering; removable at stops.

F. Fixture Support: Concealed arm for wall-mounting, lavatory-type fixture.

2.3 SHOWER:

A. Plastic Shower Enclosure: ANSI Z124.2 and ANSI Z124.2a; acrylic plastic,.

1. Basis-of-Design Product: Product indicated on Drawings or comparable product by one of the following:

B. Mixing-Valve Faucet and Miscellaneous Fittings: Single-lever, thermostatic and pressure-balance antiscald-type faucet; maximum 2.5-gpm (0.16-L/s) flow rate.

1. Basis-of-Design Product: B&K Faucets or comparable product by one of the following:

2. Include ball, gate, or globe valves on supplies if check stops are not included with faucet.

3. Body Material: Solid brass.

4. Finish: Polished chrome-plate.

C. Drain: NPS 2 (DN 50), nickel-bronze-strainer, floor drain.

2.4 SINK:

A. Stainless-Steel Sink: Counter-mounting, self-rimming type, 0.063 inch (1.6 mm) thick,.

B. Faucet: Solid brass. Maximum 2.5-gpm (0.16-L/s) flow rate.

1. Type: Center set with central inlets, with spray.

2. Finish: Polished chrome-plate.

3. Handle(s): Single-lever toggle.

4. Spout: Swing with aerator 1-1/2-gpm (0.1-L/s) laminar flow.

C. Disposer: 1/3 hp, UL labeled.

D. Drain(s): 1-1/2-inch (38-mm) grid strainer with.

PART 3 - EXECUTION

3.1 INSTALLATIONS

A. Install fitting insulation kits on fixtures for people with disabilities.

B. Install fixtures with flanges and gasket seals.

C. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

D. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

E. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

F. Fasten floor-mounted fixtures to substrate. Fasten fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.

G. Fasten wall-mounted fittings to reinforcement built into walls.

H. Fasten counter-mounting plumbing fixtures to casework.

I. Set shower receptors and mop basins in leveling bed of cement grout.

J. Install individual supply inlets, supply stops, supply risers, and tubular brass traps with cleanouts at fixture.

K. Install traps on fixture outlets. Omit traps on fixtures having integral traps. Omit traps on indirect wastes unless otherwise indicated.

L. Install disposers in sink outlets. Install switch where indicated, or in wall adjacent to sink if location is not indicated.

M. Install hot-water dispensers in back top surface of sink or in counter with spout over sink.

N. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.

O. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

P. Install piping connections between plumbing fixtures and piping systems and plumbing equipment. Install insulation on supplies and drains of fixtures for people with disabilities.

Q. Ground equipment.

END OF SECTION 15410

SECTION 15450-PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1. SCOPE

A. Extent of plumbing equipment work is indicated on drawings and provisions of this section, including schedules and equipment lists associated with either drawings or this section.

B. Types of plumbing equipment required for project include the following:

1. Separators:

a. Sand and Sediment separator.

b. Oil separator.

2. Collection tank:

a. Oil collection tank.

3. Equipment Furnished in Other Sections:

a. Miscellaneous equipment rough-in and final connections.

1.2. QUALITY ASSURANCE

A. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters Laboratories and comply with NEMA standards.

B. NEC Compliance: Comply with National Electrical Code (NEC 70) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.

1. Commercial Water Heaters

C. ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.

D. AWWA Compliance: Comply with applicable American Water Works Association standards pertaining to steel water tanks.

1.3. SUBMITTALS

A. Comply with Section 01300, Submittals.

B. Product Data: Submit manufacturer's plumbing equipment specifications, installations and start-up instructions, and capacity and ratings, with selection points clearly indicated.

C. Wiring Diagrams: Submit ladder-type wiring diagrams for all components, clearly indicating all required field electrical connections.

D. Maintenance Data: Submit maintenance data and parts lists for each item of plumbing equipment. Include "trouble-shooting" maintenance guides. Include this data in maintenance manual.

PART 2 - PRODUCTS

2.1. SEPARATORS

A. Sand and Sediment Separator

1. Provide rotationally molded, seamless, high density polyethylene constructed tank for below grade installation with intermittent flow as indicated on schedule and drawings. Unit complete with plain end inlet and outlet connections, plain end vent connection, thick plastic cover, secured with stainless steel bolts, neoprene gasket and removable polyethylene sediment bucket unless otherwise noted on plans.

B. Oil Separator

1. Provide rotationally molded, seamless, high density polyethylene constructed tank for below grade installation with intermittent flow as indicated on schedule and drawings. Unit complete with plain end inlet and outlet connections, plain end vent connection, tapped adjustable draw-off connection, thick plastic cover, secured with stainless steel bolts, heavy duty leak proof gasket, visible double wall outside trap seal and easily removable V-screen unless otherwise noted on plans.

2.2. COLLECTION TANK

A. Oil Collection Tank

1. Provide rotationally molded, seamless, high density polyethylene constructed tank for below grade installation with liquid holding capacity as indicated on schedule and drawings. Unit complete with 1-1/2” FPT inlet connection, plain end vent connection, thick plastic cover, secured with stainless steel bolts, heavy duty leak proof gasket.

PART 3 - EXECUTION

3.1. INSTALLATION OF SEPARATORS

A. Sand and Sediment Separator

1. Install separators as indicated, in accordance with manufacturer’s recommendations, specifier requirements and all applicable state/local codes and requirements.

2. Install Separator as close to fixture(s) as possible. Install Separator below grade, making sure there is enough room above and around Interceptor for proper cleaning and maintenance.

3. Separator must be placed on flat, solid surface allowing support of bottom. All units must be fully supported on bottom with flat surface strong enough to hold the unit weight and water/sludge capacity. All Separators must be independently supported to avoid stress on fitting connections.

4. Connect inlet piping.

5. Connect outlet piping to vented sanitary drain piping to prevent siphoning, as required by local code.

6. Connect vent piping to vent connection located directly on unit.

7. After piping is installed, inspect all pipe joints to ensure there are no leaks.

8. If no leaks occur, make sure internal Sediment Bucket(s) and cover(s) are properly secured.

9. If applicable, fill unit with water before backfilling. Polyethylene units may be backfilled with fine sand. When installing Polyethylene units, make sure backfill is free of sharp stones and foreign matter to avoid puncture.

10. Concrete may be poured. Concrete should reach a minimum of 4" deep, 6" deep if Anchor Flange is used. If located in rough area, a concrete pad should extend 18" around all sides of unit. Keep cover protected and in place during concrete pour.

B. Oil Separator

1. Install separators as indicated, in accordance with manufacturer’s recommendations, specifier requirements and all applicable state/local codes and requirements.

2. Install Separator as close to fixture(s) as possible. Install Separator below grade, making sure there is enough room above and around Interceptor for proper cleaning and maintenance.

3. Separator must be placed on flat, solid surface allowing support of bottom. All units must be fully supported on bottom with flat surface strong enough to hold the unit weight and water/sludge capacity. All Separators must be independently supported to avoid stress on fitting connections.

4. Connect vent piping to vent connections on unit.

5. Connect and vent outlet piping to vented sanitary drain piping to prevent siphoning, as required by local code.

6. Adjust oil draw-off to correct position.

7. After piping is installed, inspect all pipe joints to ensure there are no leaks.

8. Fill unit with water before backfilling. Polyethylene units may be backfilled with fine sand. When installing Polyethylene units, make sure backfill is free of sharp stones and foreign matter to avoid puncture.

9. Concrete may be poured. Concrete should reach a minimum of 4" deep, 6" deep if Anchor Flange is used. If located in rough area, a concrete pad should extend 18" around all sides of unit. Keep cover protected and in place during concrete pour.

3.2. INSTALLATION OF OIL COLLECTION TANK

A. Install collection tank as indicated, in accordance with manufacturer's recommendations, specifier requirements and all applicable state/local codes and requirements.

B. Install collection tank below grade, making sure there is enough room above and around Interceptor for proper cleaning and maintenance.

C. Collection tank must be placed on flat, solid surface allowing support of bottom. All units must be fully supported on bottom with flat surface strong enough to hold the unit weight and water/sludge capacity. All collection tanks must be independently supported to avoid stress on fitting connections.

D. Connect inlet piping.

E. Connect vent piping to vent connections on unit.

F. Connect and vent outlet piping to vented sanitary drain piping to prevent siphoning, as required by local code.

G. After piping is installed, inspect all pipe joints to ensure there are no leaks.

H. Fill unit with water before backfilling. Polyethylene units may be backfilled with fine sand. When installing Polyethylene units, make sure backfill is free of sharp stones and foreign matter to avoid puncture.

I. Concrete may be poured. Concrete should reach a minimum of 4" deep, 6" deep if Anchor Flange is used. If located in rough area, a concrete pad should extend 18" around all sides of unit. Keep cover protected and in place during concrete pour.

3.3. INSTALLATION OF EQUIPMENT FURNISHED IN OTHER SECTIONS

A. Rough-in and connect equipment furnished in other sections (or by Owner) requiring plumbing rough-in and connections such as:

1. Miscellaneous equipment.

B. Piping: Connect hot and cold water and drain as required, in accordance with manufacturer installation instructions if applicable and in compliance with applicable codes.

END OF SECTION 15450

 

SECTION 15485 - ELECTRIC, DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Comply with requirements of applicable NSF, AWWA, or FDA and EPA regulatory standards for tasteless and odorless, potable-water-tank linings.

C. Comply with performance efficiencies prescribed in ASHRAE 90.2, "Energy Efficient Design of New Low-Rise Residential Buildings."

D. .98 Efficiency Factor Minimum

E. Warranties: Submit a written warranty executed by manufacturer agreeing to repair or replace water heaters that fail in materials or workmanship within five years from date of Substantial Completion. Failures include, but are not limited to, tanks and elements.

PART 2 - PRODUCTS

2.1 WATER HEATERS, GENERAL

A. Insulation: Suitable for operating temperature and required insulating value. Include insulation material that surrounds entire tank except connections and controls.

B. Anode Rods: Factory installed, magnesium.

C. Combination Temperature and Pressure Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input and pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into tank.

D. Drain Valve: Factory or field installed.

2.2 ELECTRIC WATER HEATERS

A. Household, Storage, Electric Water Heaters: UL 174, 40-gal. capacity; steel with 150-psig working-pressure rating. One electric, screw-in, immersion-type heating elements with adjustable thermostat for each element and wiring arrangement for nonsimultaneous operation with maximum 30-A circuit.

B. Thermostat-Control, Instantaneous Electric Water Heaters: UL 499, 0.5-gal. (1.89-L) capacity; with 150-psig (1035-kPa) working-pressure rating; 120 volts, 750 watts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install temperature and pressure relief valves and extend to closest floor drain.

B. Install vacuum relief valves in cold-water-inlet piping.

C. Install shutoff valves and unions at hot- and cold-water piping connections.

D. Make piping connections with dielectric fittings where dissimilar piping materials are joined.

E. Electrically ground units according to authorities having jurisdiction.

END OF SECTION 15485

SECTION 15530-REFRIGERANT PIPING

PART 1 - GENERAL

1.1. DESCRIPTION OF WORK

A. Extent of refrigerant piping work is indicated on drawings and schedules, and by requirements of this section.

B. Refer to other Section 15250 for insulation of refrigerant piping; not work of this section.

1.2. QUALITY ASSURANCE

A. Codes and Standards:

1. ANSI Compliance: Fabricate and install refrigerant piping in accordance with ANSI B31.5 "Refrigeration Piping", and extend applicable lower pressure limits to pressures below 15 psig.

2. ASHRAE Compliance: Fabricate and install refrigerant piping in accordance with ASHRAE 14 "Safety Code for Mechanical Refrigeration".

1.3. SUBMITTALS

A. Product Data: Submit manufacturer' technical product data and installation instructions for refrigerant piping materials and products.

B. Brazing Certification: Certify brazing procedures, brazers and operators in accordance with ASME standards (ANSI B31.5).

C. Maintenance Data: Submit maintenance data and parts lists for refrigerant piping materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.1. MATERIALS AND PRODUCTS

A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ANSI B31.5 Code for Refrigeration Piping where applicable, base pressure rating on refrigerant piping system maximum designpressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in refrigerant piping systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2.2. BASIC PIPES AND PIPE FITTINGS

A. Provide pipe and pipe fittings complying with Section on "Pipes, Tubes and Fittings", in accordance with the following listing:

1. Tube Size 4-1/8" and Smaller: Copper tube; Type ACR, hard-drawn temper; wrought-copper, solder-joint fittings; brazed joints.

2. Tube Size 3/4" and Smaller: Copper tube; Type ACR, soft annealed temper fittings; cast copper-alloy fittings for flared copper tubes; flared joints.

3. Tube Size 7/8" through 4-1/8": Copper tube; Type ACR, soft annealed temper; wrought-copper, solder-joint fittings; soldered joints.

4. Tube Size 7/8" through 4-1/8": Copper tube; Type ACR, soft annealed temper; wrought-copper, solder-joint fittings, brazed joints.

5. Soldered Joints: Solder joints using silver-lead solder, ASTM B32, Grade 96 TS.

6. Brazed Joints: Braze joints using American Welding Society (AWS) classification BCuP-4 for brazing filler metal.

## 2.3. BASIC PIPING SPECIALITIES

A. Provide piping specialties complying with Section "Piping Specialties", in accordance with the following listing:

1. Pipe escutcheons.

2. Drip pans.

3. Sleeves.

4. Sleeve seals.

## 2.4. BASIC SUPPORT AND ANCHORS

A. Provide supports and anchors complying with Section "Supports and Anchors".

## 2.5. SPECIAL REFRIGERANT VALVES

A. Special valves where required for refrigerant piping include the following types:

1. Globe Shutoff Valves: Forged brass, packed, back seating, winged seal cap, 300 degrees F (149 degrees C) temperature rating, 500 psi working pressure.

2. Check Valves: Forged brass, accessible internal parts, soft synthetic seat, fully guided brass piston and stainless steel spring, 250 degrees F (121 degrees C) temperature rating, 500 psi working pressure.

3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering globe and check valves which may be incorporated in the work include, but are not limited to, the following:

a. Henry Valve Company

b. Parker Hannifin Corporation; Refrigeration and Air Conditioning Division

c. Sporlan Valve Company

B. Solenoid Valves:

1. 2-Way Solenoid Valves: Forged brass, designed to conform to ARI 760, normally closed, teflon valve seat, NEMA 1 solenoid enclosure, 24 volt, 60 Hz., UL Listed, 1/2" conduit adapter, 250 degrees F (121 degrees C) temperature rating, 400 psi working pressure.

2. Manual Operator: Provide manual operator to open valve.

3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering solenoid valves which may be incorporated in the work include, but are not limited to the following:

a. Alco Controls Division; Emerson Electric Company

b. Automatic Switch Company

c. Sporlan Valve Company

2.6. REFRIGERANT SPECIALITIES

A. Refrigerant Strainers: Brass shell and end connections, brazed joints, monel screen, 100 mesh, UL Listed, 350 psi working pressure.

B. Moisture-Liquid Indicators: Forged brass, single port, removable cap, polished optical glass, solder connections, UL Listed, 200 degrees F (93 degrees C) temperatures rating, 500 psi working pressure.

C. Refrigerant Filter-Dryers: Steel shell, ceramic fired desiccant core, solder connections, UL Listed, 500 psi working pressure.

D. Refrigerant Filter-Dryers: Corrosion-resistant steel shell, steel flange ring and spring, wrought copper fittings, ductile iron cover plate with steel screws, replaceable filter-drier core, 500 psi working pressure.

E. Evaporator Pressure-Regulators: Provide corrosion-resistant, spring loaded, stainless steel springs, pressure operated, evaporator pressure regulator, in size and working pressure indicated, with copper connections.

F. Refrigerant Discharge Line Mufflers: Provide discharge line mufflers as recommended by equipment manufacturer for use in service indicated, UL Listed.

G. Available Manufacturers: Subject to compliance with requirements manufacturers offering refrigeration accessories which may be incorporated in the work include, but are not limited to the following:

1. Alco Controls Division; Emerson Electric Company

2. Henry Valve Company

3. Parker-Hannifin Corporation; Refrigeration and Air-Conditioning Division

4. Sporlan Valve Company

PART 3 - EXECUTION

3.1. INSPECTION

A. Examine areas and conditions under which refrigerant piping systems materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

## 3.2. INSTALLATION OF REFRIGERANT PIPING

A. Install refrigerant piping in accordance with Section "Pipes, Tubes and Fittings", and in compliance with equipment manufacturer's recommendations.

 

B. Install refrigerant piping with 1/4" per foot (1%) downward slope in direction of oil return to compressor. Provide oil traps and double risers where indicated, and where required to provide oil return.

C. Clean refrigerant piping by swabbing with dry lintless (linen) cloth, followed by refrigerant oil soaked swab. Remove excess oil by swabbing with cloth soaked in high flash point petroleum solvent, squeezed dry.

D. Bleed dry nitrogen through refrigerant piping during brazing operation.

## 3.3. INSTALLATION OF SUPPORTS AND ANCHORS

A. Install supports and anchors in accordance with requirements of Section "Supports and Anchors".

## 3.4. INSTALLATION OF SPECIAL REFRIGERANT VALVES

A. Install refrigerant valves where indicated, and in accordance with manufacturer's instructions. Remove accessible internal parts before soldering or brazing, replace after joints are completed.

B. Solenoid Valves: Install in refrigerant piping as indicated with stem point upwards.

1. Wiring of solenoid valves is specified in applicable Division-16 sections, and is included a work of this section.

2. Wiring of solenoid valves is specified in applicable Division-16 sections, not work of this section.

## 3.5. INSTALLATION OF REFRIGERANT ACCESSORIES

A. Refrigerant Strainers: Install in refrigerant lines as indicated, and in accessible location for service.

B. Moisture-Liquid Indicators: Install as indicated on refrigerant liquid lines, in accessible location.

C. Refrigerant Filter-Dryers: Install in refrigerant lines as indicated, and in accessible location for service.

D. Evaporator Pressure Regulators: Install in refrigerant suction lines or evaporator outlets as indicated. Adjust, if required, for proper evaporator pressure.

E. Refrigerant Discharge Line Mufflers: Install as indicated, in horizontal or downflow portion of hot-gas lines, immediately after leaving compressor; not in riser.

## 3.6. EQUIPMENT CONNECTIONS

A. Connect refrigerant piping to mechanical equipment as indicated, and comply with equipment manufacturer's instructions where not otherwise indicated.

3.7. FIELD QUALITY CONTROL

A. Refrigerant Piping Leak Test: Prior to initial operation, clean and test refrigerant piping in accordance with ANSI B31.5, "Refrigeration Piping". Perform initial test with dry nitrogen, using soap solution to test all joints. Perform final test with 27" vacuum, and then 200 psi using halide torch. System must be entirely leak-free.

B. Repair or replace refrigerant piping as required to eliminate leaks, and retest as specified to demonstrate compliance.

3.8. DEHYDRATION AND CHARGING SYSTEM

A. Install core in filter dryer after leak test but before evacuation.

B. Evacuate refrigerant system with vacuum pump, until temperature of 35 degrees F (2 degrees C) is indicated on vacuum dehydration indicator.

C. During evacuation, apply heat to pockets, elbows, and low spots in piping.

D. Maintain vacuum on system for minimum of five (5) hours after closing valve between vacuum pump and system.

E. Break vacuum with refrigerant gas, allow pressure to building up to 2 psi.

F. Complete charging of system, using new filter dryer core in charging line. Provide full operating charge.

3.9. ADJUSTING AND CLEANING

A. Cleaning and Inspecting: Clean and inspect refrigerant piping systems in accordance with requirements of Section "Pipes, Tube and Fittings".

END OF SECTION 15530

 

SECTION 15613-ELECTRIC AIR HANDLERS

PART 1 - GENERAL

1.1. DESCRIPTION OF WORK:

A. Types of air terminals specified in this section include the following:

1. Air Handler Terminals

B. Refer to the other Section 15990 for testing, adjusting and balancing of air terminals: not work of this section.

C. Refer to Division 16 for the following work; not work of this section.

1. Power supply wiring from power source to power connection on air terminals. Include installation of starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

1.2. QUALITY ASSURANCE:

A. Codes and Standards:

1. ADC Compliance: Provide air terminals which have been tested and rated in accordance with ADC standards, and bear ADC Seal.

2. ARI Compliance: Provide air terminals which have been tested and rated in accordance with ARI 880 "Industry Standard for Air Terminals" and bear ARI certification seal.

3. NFPA Compliance: Construct air terminals using acoustical and thermal insulations complying with NFPA 90A "Air Conditioning and Ventilating Systems".

1.3. SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, including performance data for each size and type of air terminal furnished; schedule showing drawing designation, room location, number furnished, model number, size and accessories furnished; and installation and start-up instructions.

B. Shop Drawings: Submit manufacturer’s assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.

C. Wiring Diagrams: Submit ladder-type wiring diagrams for electric power and control components, clearly indicating required field electrical connections.

D. Maintenance Data: Submit maintenance data and parts lists for each type of air terminal; including "trouble shooting" maintenance guide. Include this data, product

data, shop drawings, and maintenance data in maintenance manual; in accordance with requirements of Division 1.

1.4. DELIVERY, STORAGE, AND HANDLING:

A. Deliver air terminals wrapped in factory-fabricated fiberboard type containers. Identify on outside of container type of air terminal and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in boxes.

B. Store air terminals in original cartons and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements: Carrier, York, Trane

2.2. AIR HANDLER:

A. Provide factory-fabricated and tested air handler as indicated, selected with performance characteristics which match or exceed those indicated on schedule.

B. Casings: Construct of die-cast aluminum or sheet metal of 22 ga. the minimum thicknesses:

1. Provide hanger brackets for attachment of supports.

2. Linings: Line inside surfaces of casings with lining material to provide acoustic performance, thermal insulation, and to prevent condensation on outside surfaces of casing. Provide minimum thickness of 3/4". Secure lining to prevent delamination, sagging, or settling.

3. Cover liner surfaces and edges with casing or perforated metal.

4. Access: Provide removable panels in casings to permit access to air dampers and other parts requiring service, adjustment, or maintenance.

a. Provide airtight gasket and quarter-turn latches.

5. Leakage: Construct casings such that when subjected to 0.5-in w.g. pressure for low pressure units, and 3.0-in w.g. pressure for high pressure units, total leakage does not exceed 4% of specified air flow capacity with outlets sealed and inlets wide open. Construct air dampers such that when subjected to 6.0-in w.g. inlet pressure with damper closed, total leakage does not exceed 10% of specified air flow capacity.

6. Multiple Duct Connectors: For air terminals serving more than one air outlet, provide lined outlet plenum with duct collar, butterfly-type damper, and locking device in each outlet.

C. Air Handler:

1. Fan Section: Provide galvanized steel plenum, acoustically lined, housing forward curved fan with belt or direct driven permanent split capacitor motor. Provide air filter and back draft damper.

2. Electric Heating Section: Provide KW heater as indicated on plans.

PART 3 - EXECUTION

3.1. INSPECTION:

A. Examine areas and conditions under which air terminals are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Install .

3.2. INSTALLATION OF AIR HANDLER

A. Install air handler as indicated and in accordance with manufacturer's installation instructions.

B. Location: Install each unit level and accurately in position indicated in relation to other work; and maintain sufficient clearance for normal service and maintenance, but in no case less than that recommended by manufacturer.

C. Duct Connections: Connect ductwork to air handler in accordance with Division 15 ductwork sections.

3.3. FIELD QUALITY CONTROL:

A. Upon completion of installation and prior to initial operation, test and demonstrate that air handler, and duct connections to air terminals, are leak-tight.

B. Repair or replace air handler and duct connections as required to eliminate leaks, and retest to demonstrate compliance.

3.4. CLEANING:

A. Clean exposed factory-finished surfaces. Repair any marred or scratched surfaces with manufacturers touch-up paint.

END OF SECTION 15613

 

SECTION 15736 - SELF-CONTAINED AIR-CONDITIONING UNITS (15 TONS AND SMALLER)

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Comply with ASHRAE 15.

B. Comply with NFPA 70.

C. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace refrigeration components that fail in materials or workmanship within Insert number years from date of Substantial Completion.

D. All equipment to be Energy Star Rated at installation.

PART 2 - PRODUCTS

2.1 PACKAGED UNITS

A. Description: Self-contained, factory-assembled, -tested, and -wired unit.

1. Product: Goodman CPR Series 16.0 SEER, 9.0 HSPF

B. Cabinet: Structural-steel frame and galvanized-steel panels with baked-enamel finish with access doors or panels. Minimum 1/2-inch- (13-mm-) thick, acoustic duct liner on cabinet interior and control panel. Galvanized steel with corrosion-resistant coating drain pan.

C. Discharge Plenum: Cabinet extension with directional louvers.

D. Evaporator Fan: Galvanized steel; double-width, double-inlet, forward-curved centrifugal fan; statically and dynamically balanced. Direct drive with fan and motor resiliently mounted. Cast-iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Adjustable pitch selected so required rpm are obtained when set at midposition. Motor, multispeed, PSC type, or single speed, ODP polyphase.

E. Evaporator and Condenser Coil: Seamless copper tubes expanded into aluminum fins; leak tested to 425 psig (2930 kPa).

F. Integral Air-Cooled Condenser: Factory assembled and tested; consisting of condenser coil, fans and motors, and operating controls. Direct-drive propeller-type fans with permanently lubricated motors and built-in thermal-overload protection. Low-ambient control cycle fans and modulates condenser-fan damper assembly to permit operation down to 0 deg F (minus 18 deg C).

1. Annealed-copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; insulated suction line; appropriate fittings at ends, and service valves for both suction and liquid lines.

G. Compressor: Hermetic scroll, 3600 rpm maximum; resiliently mounted with positive lubrication and internal motor protection.

H. Refrigerant Circuits: Separate circuit for each compressor. Minimum two circuits for units larger than five nominal tons. Equalized expansion valve with replaceable thermostatic element, refrigerant filter-dryer, high- and low-pressure safety switches, thermal overload protection, anti-recycle timer, brass service and charging valves installed in hot-gas and liquid lines, and charged with R-22 refrigerant.

I. Water Coil: Copper tube, with mechanically bonded aluminum fins; two-position control valve; and leak tested to 300 psig (2070 kPa) underwater.

J. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and fuses in terminal box for overcurrent protection.

K. Disposable Filters: 1-inch- (25-mm-) thick, glass-fiber, flat panel filters.

L. Control Package: Factory wired and tested, including control-circuit transformer.

1. Thermostat: Remote, programmable for occupied/unoccupied periods and temperatures to cycle compressor or heating coil. Provide field wiring for condenser fan operation with compressor.

2. Supply fan runs on fan control switch. Opens outdoor-air damper during occupied periods.

3. Motorized Outside-Air Damper: Motorized, two-position blade damper allowing induction of up to 25 percent outside air; with spring-return, low-voltage damper motor.

4. Economizer: Damper assembly allowing induction of up to 100 percent outside air to maintain a selected mixed-air temperature; and exhaust damper with spring-return, low-voltage, modulating damper motor with minimum position adjustment.

## 2.2 CAPACITIES AND CHARACTERISTICS

A. HSPF:

1. Minimum 9.0 HSPF

B. SEER:

1. Minimum 16.0 SEER Compressor

PART 3 - EXECUTION

3.1 INSTALLATION

A. Isolation: Mount cabinet and remote air-cooled condenser on rubber-in-shear pads for minimum 1-inch (25-mm) static deflection.

B. Install piping adjacent to unit to allow service and maintenance.

C. Install refrigerant piping between self-contained air-conditioning unit and remote condenser.

D. Install condensate piping to indirect drain.

END OF SECTION 15736

SECTION 15810 - DUCTS AND ACCESSORIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Summary: Metal and nonmetal ducts and accessories in pressure classes 2-inch wg (500 Pa) or less and a maximum velocity of 2400 fpm (12 m/s).

B. Comply with NFPA 90B for systems serving spaces in 1- or 2-family dwellings or serving spaces less than 25,000 cu. ft. (708 cu. m).

PART 2 - PRODUCTS

2.1 DUCTS

A. Joint and Seam Tape, and Sealant: Comply with UL 181A.

B. Rectangular Metal Duct Fabrication: Comply with SMACNA's "HVAC Duct Construction Standard" for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

C. Fibrous-Glass Duct Fabrication: Comply with SMACNA's "Fibrous Glass Duct Construction Standard."

2.2 ACCESSORIES

A. Volume-Control Dampers: Factory-fabricated volume-control dampers, complete with required hardware and accessories. Single blade and multiple opposed blade, standard leakage rating, and suitable for horizontal or vertical applications.

B. Smoke Dampers: Factory-fabricated smoke and fire dampers, complete with required hardware and accessories. UL labeled according to UL 555S, "Leakage Rated Dampers for Use in Smoke Control Systems." Combination fire and smoke dampers shall also be UL labeled for 1-1/2-hour rating according to UL 555, "Fire Dampers."

C. Flexible Connectors: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

D. Flexible Ducts: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-inch- (25-mm-) thick, glass-fiber insulation around a continuous inner liner.

 

PART 3 - EXECUTION

3.1 INSTALLATION

A. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.

B. Conceal ducts from view in finished and occupied spaces.

C. Avoid passing through electrical equipment spaces and enclosures.

D. Support and connect metal ducts according to SMACNA's "HVAC Duct Construction Standard."

E. Support and connect fibrous-glass ducts according to SMACNA's "Fibrous Glass Duct Construction Standard."

F. Install duct accessories according to details of construction as shown in SMACNA standards.

G. Install volume-control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner.

H. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.

I. Install fusible links in fire dampers.

3.2 TESTING, ADJUSTING, AND BALANCING

A. Balance airflow within distribution systems, including submains, branches, and terminals to indicated quantities.

END OF SECTION 15810

SECTION 15860-FANS

PART 1 - GENERAL

1.1. SCOPE

A. Extent of fan work is indicated by Drawings and schedules, and by requirements of this Section.

B. Types of equipment fans required for project include (Inline Centrifugal Fans).

1.2. RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Provide the following electrical work as work of this Section, complying with requirements of Division 16 sections:

1. Motor Starters, Section 16480.

2. Motor disconnect switches, Section 16440.

1.3. QUALITY ASSURANCE

A. AMCA Compliance: Provide fans bearing the Air Movement and Control Association, Inc. (AMCA) Certified Ratings Seal.

B. AMCA Compliance: Test and rate centrifugal fans in accordance with (AMCA 210) "Laboratory Methods of Testing Fans for Rating".

C. UL Compliance: Provide fan electrical components which have been listed and labeled by Underwriters Laboratories (UL).

1.4. SUBMITTALS

A. Comply with Section 01300, Submittals.

B. Product Data: Submit manufacturer's data for fans, including specifications, capacity ratings, fan performance curves with operating point clearly indicated, gauges, and finishes of materials, dimensions, weights, accessories furnished, and installation instructions.

C. Maintenance Data: Submit maintenance instructions, including lubrication instructions, motor and drive replacement, and spare parts lists.

1.5. PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver fans with factory-installed shipping skids and lifting lugs; pack components in factory-fabricated protective containers.

PART 2 - PRODUCT

2.1. INLINE CENTRIFUGAL FANS

A. Provide inline centrifugal fans of sizes and arrangement as indicated, and of capacities and having accessories as scheduled.

B. Housing: Aluminum housing, with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting

C. Direct-Drive Units: Provide ball bearing motor encased in housing so as to be out of air stream. Provide factory wiring to disconnect located on outside of fan housing.

D. Belt-Driven Units: Provide ball bearing motor mounted on adjustable base, with adjustable sheaves. Provide enclosure around belts.

E. Wheels: Provide aluminum air foil blades on aluminum hub.

F. Available Manufacturers: ACME, Cook, or acceptable equal.

PART 3 - EXECUTION

3.1. INSPECTION

A. Examine areas and conditions under which centrifugal fans are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2. INSTALLATION OF CENTRIFUGAL FANS

A. Install centrifugal fans where indicated, in accordance with manufacturer's installation instructions, and with required industry practices, to ensure that centrifugal fans comply with requirements and serve intended purposes. Follow applicable codes for minimum distance from roof to inlet of rooftop units.

B. Access: Provide access and service space around and over centrifugal fans as indicated, but in no case less than that recommended by manufacturer.

C. Ductwork Connections: Refer to Section 15910, Ductwork. Provide flexible connections on inlet and outlet duct connections.

D. Furnish starters for each fan. Starters are installed in Division 16.

3.3. FIELD QUALITY CONTROL

A. Upon completion of installation of centrifugal fans, and after motor has been energized with normal power source, test equipment to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment which cannot be satisfactorily corrected.

3.4. ADJUSTING AND CLEANING

A. Start-up, test, and adjust centrifugal fans in presence of manufacturer's authorized representative.

3.5. SPARE PARTS

A. Furnish to Owner, with receipt, on spare set of belts for each belt driven centrifugal fan.

END OF SECTION 15860

SECTION 15885-AIR CLEANING

PART 1 - GENERAL

1.1. DESCRIPTION OF WORK

A. Extent of air cleaning work required by this Section is indicated on Drawings and Schedules, and by requirement of this Section.

B. Types of air cleaning equipment specified in this Section include the following:

1. Air Filters:

a. Replaceable (throwaway)

2. Filter Holding Systems:

a. Bottom servicing housings

3. Filter Gauges.

1.2. QUALITY ASSURANCE

A. Codes and Standards:

1. NFPA Compliance: Comply with applicable portions of NFPA 90A and 90B, and NEC pertaining to installation of air filters and associated electric wiring and equipment.

2. UL Compliance: Comply with UL Standards pertaining to safety and performance of air filter units.

3. ASHRAE Compliance: Comply with provisions of ASHRAE Standard 52 for method of testing, and for recording and calculating air flow rates.

1.3. SUBMITTALS

A. Comply with Section 01300, Submittals.

B. Product Data: Submit manufacturer's technical product data including, dimensions, weights, required clearances and access, flow capacity including initial and final pressure drop at rated air flow, efficiency and test method, fire classification, and installation instructions.

PART 2 - PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering air cleaning equipment which may be incorporated in the work include, but are not limited to, the following: Camfil Farr Co., Cambridge, or acceptable equal.

2.2. AIR FILTERS

A. Rigid Extended Area:

1. Filters shall be Camfil Farr 30/30, medium efficiency, pleated disposable type. Each filter shall consist of a non-woven cotton and synthetic fabric media, media support grid and enclosing frame. The filter shall be listed by Underwriters' Laboratories as Class 2.

2. Filter media shall be of the non-woven cotton fabric type. The filter media shall provide MERV 8 ASHRAE efficiency when evaluated under ASHRAE Standard 52.2 -1999 and a 25-30% average efficiency when evaluated under ASHRAE Standard 52.1 - 1992.

a. One (1") inch: The effective filter media shall be not less than 2.3 square feet of media per 1.0 square foot of filter face area and shall contain not less than 16 pleats per linear foot. Initial resistance at 500 fpm approach velocity shall not exceed .45" w.g.

3. The media support shall be a welded wire grid with an effective open area of not less than 96%. The welded wire grid shall be bonded to the filter media to eliminate the possibility of media oscillation and media pull away. The media support grid shall be formed in such a manner that it effects a radial pleat design, allowing total use of filter media.

4. The enclosing frame shall be constructed of a rigid, heavy-duty, high wet-strength beverage board, with diagonal support members bonded to the air entering and air exiting side of each pleat, to ensure pleat stability. The inside periphery of the enclosing frame shall be bonded to the filter pack, thus, eliminating the possibility of air bypass.

PART 3 - EXECUTION

3.1. INSPECTION

A. Examine areas and conditions under which air filters and filter housing will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2. INSTALLATION

A. Comply with installation requirements as specified elsewhere in these specifications pertaining to air filters housing/casings, and associated supporting devices.

B. Install air filters and holding devices of types indicated, and where shown; in accordance with air filter manufacturer's written instructions and with recognized industry practices; to ensure that filters comply with requirements and serve intended purposes.

C. Locate each filter unit accurately in position indicated, in relation to other work. Position unit with sufficient clearance for normal service and maintenance. Anchor filter holding frames securely to substrate.

D. Coordinate with other work including ductwork and air handling unit work, as necessary to interface installation of filters properly with other work.

E. Install filters in proper position to prevent passage of unfiltered air.

F. Install air filter gauge pressure tips upstream and downstream of filters to indicate air pressure drop through air filter. Mount filter gauges on outside of filter housing or filter plenum, in accessible position. Adjust and level inclined gauges, if any, for proper readings.

## 3.3. FIELD QUALITY CONTROL

A. Operate installed air filters to demonstrate compliance with requirements. Test for air leakage of unfiltered air while system is operating. Correct malfunctioning units at site, then retest to demonstrate compliance; otherwise remove and replace with new units, and proceed with retesting.

## 3.4. EXTRA STOCK

A. Provide one complete extra set of filters for each air handling system. If system is designed to include pre-filters and after-filters, provide only pre-filters. Install new filters at completion of

air handling system work, and prior to testing, adjusting, and balancing work. Obtain receipt from Owner that new filters have been installed.

END OF SECTION 15885

SECTION 15932-AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1. DESCRIPTION OF WORK

A. Extent of air outlets and inlets work is indicated by drawings and schedules, and by requirements of this section.

B. Types of air outlets and inlets required for project include the following:

1. Ceiling air diffusers

2. Wall registers and grilles.

3. Louvers.

C. Refer to section 15990 for balancing of air outlets and inlets; not work of this section.

1.2. QUALITY ASSURANCE

A. Codes and Standards:

1. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".

2. ADC Seal: Provide air outlets and inlets bearing ADC Certified Rating Seal.

3. AMCA Compliance: Test and rate louvers in accordance with AMCA 500 "Test Method for Louvers, Dampers and Shutters".

4. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

1.3. SUBMITTALS

A. Comply with section 01300. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:

1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size, and accessories furnished.

2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.

3. Performance data for each type of air outlet and inlet furnished, including aspiration ability, temperature and velocity traverses, throw and drop, and noise criteria ratings. Indicate selections on data.

B. Maintenance Data: Submit maintenance data, including cleaning instructions for finish, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division-1.

1.4. PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver air outlets and inlets wrapped in factory-fabricated fiber-board type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.

B. Store air outlets and inlets in original cartons and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

## PART 2 - PRODUCTS

### 2.1. CEILING DIFFUSERS

A. Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.

B. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.

C. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.

D. Types: As scheduled on drawings.

E. Available Manufacturers:

1. Price, Titus Products Div., Philips Industries, Inc., or acceptable equal.

### 2.2. WALL REGISTERS AND GRILLES

A. Except as otherwise indicated, provide manufacturer's standard wall registers and grilles where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.

B. Performance: Provide wall registers and grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.

C. Wall Compatibility: Provide registers and grilles with border styles that are compatible with adjacent wall systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction which will contain each type of wall register and grille.

D. Types: Provide wall registers and grilles of type, capacity, and with accessories and finishes as listed on register and grille schedule.

E. Available Manufacturers:

1. Price, Titus Products Div.; J & J Register, or acceptable equal.

2.3. LOUVERS

A. Except as otherwise indicated, provide manufacturer's standard louvers where shown; of size, shape, capacity and type indicated; constructed or materials and components as indicated, and as required for complete installation.

B. Performance: Provide louvers that have maximum free area, and minimum pressure drop for each type as listed in manufacturer's current data, complying with louver schedule.

C. Substrate Compatibility: Provide louvers with frame and sill styles that are compatible with adjacent substrate, and that are specifically manufactured to fit into construction openings with accurate fit and adequate fit and adequate support, for weatherproof openings with accurate fit and adequate support, for weatherproof installation. Refer to general construction drawings and specifications for types of substrate which will contain each type of louver.

D. Materials: Construct of aluminum extrusions, ASTM B221, Alloy 6063-T52. Weld units or use stainless steel fasteners.

E. Louver Screens: On inside face of exterior louvers, provide 1/2" square mesh anodized aluminum wire bird screens mounted in removable extruded aluminum frames. On combustion air louvers, provide 1/4" mesh bird screen.

F. Available Manufacturers:

1. Ruskin Mfg., Co., American Heating and Warming, or approved equal.

PART 3 - EXECUTION

3.1. INSPECTION

A. Examine areas and conditions under which air outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2. INSTALLATION

A. Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended function.

B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.

C. Locate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling modules.

3.3. SPARE PARTS

A. Furnish to Owner, with receipt, 3 operating keys for each type of air outlet and inlet that require them.

END OF SECTION 15932

PART 3 - EXECUTION

3.1. INSPECTION

A. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Do not proceed with TAB work until unsatisfactory conditions have been corrected in a manner acceptable to Tester.

3.2. TESTING, ADJUSTING AND BALANCING

A. Test, adjust and balance environmental systems and components, as indicated, in accordance with procedures outlined in applicable standards, and as follows:

B. Air Balance: The air balance shall include the following air tests in accordance with the following requirements:

1. Test and adjust blower RPM or vane setting to design requirements (within +/- 5% of design requirements).

2. Test and record motor full load amperes.

3. Make pilot tube traverse of main supply ducts and obtain design cfm at fans.

4. Test and record system static pressures, suction and discharge.

5. Test and adjust system for design recirculated air cfm.

6. Test and adjust outside system for design cfm outside air.

7. Test and adjust exhaust air system for design cfm.

8. Test and record entering air temperatures of heating and cooling coils (both db and wb of cooling coils).

9. Test and record leaving air temperatures of heating and cooling coils (both db and wb of cooling coils).

10. Adjust all main supply and return air ducts to proper design cfm.

11. Adjust all zones to proper design cfm, supply and return.

12. Test and adjust each outlet and inlet (diffuser, grille and register) to within +/- 10% of design requirements. Use proportional method of balancing. Do not test each outlet and inlet with hood or similar device by adjusting air flow for single reading. (Testing and adjusting single outlet without proportional balancing will result in unbalance when other outlets and inlets are adjusted.

13. Size, type and manufacturer of diffusers, grilles, registers, and tested equipment shall be identified and listed. Manufacturer's ratings on all equipment shall be used to make required calculations.

14. Readings and tests of diffusers, grilles, and registers shall include required fpm velocity and test resultant velocity, required cfm and test resultant cfm after adjustments.

15. In cooperation with the control manufacturer's representative, setting adjustments of automatically operated dampers to operate as specified, indicated and/or noted.

16. Adjust diffusers, grilles, and registers to minimum drafts in all areas.

 

17. Prepare reports of test results, including instrumentation calibration reports, in format recommended by applicable standards.

18. Patch holes in insulation, ductwork and housings, which have been cut or drilled for test purposes, in manner recommended by original Installer.

19. Mark equipment setting, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings at completion of TAB work. Provide markings with paint or other suitable permanent identification materials.

END OF SECTION

**ELECTRICAL SPECIFICATION INDEX**


ELECTRICAL SPECIFICATION INDEX

# SECTION 16000-ELECTRICAL POWER AND SYSTEMS

# PART 1 - GENERAL

1.1. SCOPE

A. The electrical work commences with the point of electrical service where shown on the drawings and includes furnishing all material and labor for a complete electrical installation.

B. The requirements of Division 1 apply to all work hereunder. The General and Special Conditions are a part of this Division of the Specifications and all provisions contained therein which affect this work are as binding as though incorporated herein.

C. The Contractor shall be responsible for construction coordination of all work described in this section with the work specified in other sections of the specifications and shown on the drawings. In advance of construction, coordinate and work out any minor problems with other trades to avoid conflicts therewith. However, if other than minor problems are encountered, bring these problems to the attention of the Architect, who will make the final decisions as to correction.

1. All references and notations pertaining to coordination by the Contractor shall apply to construction coordination. The Architect and Engineers have, to the best of their ability, coordinated the drawing and specifications to avoid conflicts between specified equipment and space required for such, and between architectural and engineering disciplines.

1.2. DEFINITIONS

A. Provide: Furnish, install, and connect.

B. Product Data: Catalog cuts and descriptive literature.

C. Shop Drawings: Factory prepared specific to the installation.

D. Signal Circuit: Voltage: 0-120 Volts.

E. Low Voltage: 120-600 Volts.

F. High Voltage: Above 600 Volts.

G. Indicated: Shown on the Contract Drawings.

H. Noted: Indicated or specified elsewhere.

1.3. DIVISION OF WORK

A. Unless otherwise noted the following are provided by Division 15.

1. Motors.

2. Electric heating and air conditioning equipment.

3. Building energy management systems.

4. Electrical heat tracing.

5. Pilot and control devices for the above equipment, except conduit rough-in is work of this section.

B. Power wiring and equipment connections for items above are specified in this Division. Control wiring for Division 15 is installed by Division 15 per the requirements of this Division. Control wiring for other divisions is installed by this division except as noted below.

C. Furnish and install any incidental work not shown or specified which can reasonably be inferred as part of the work and necessary to provide a complete and workable system.

1.4. LOCAL CONDITIONS

A. Power will be supplied by the utility company [overhead] [underground] distribution system. Verify and comply with all power company requirements for [metering, pull sections, transformer pads]. Make necessary arrangements with the power company for temporary service requirements. [Have the power company review submittals on equipment containing utility metering sections.] [and transfer switches.]

B. Verify and comply with all requirements of the local telephone company concerning the complete telephone system.

C. Existing Utilities: Locate and protect existing utilities and other underground work in manner which will ensure that no damage or service interruption will result from excavating and backfilling.

D. Protect property from damage which might result from excavating and backfilling.

E. Protect persons from injury at excavations by barricades, warnings, and illumination.

1.5. QUALITY ASSURANCE

A. Provide the complete electrical installation in accordance with the National Electrical Code (NFPA 70) and other applicable NFPA codes, Arkansas Fire Prevention Code, Arkansas Rules and Regulations for Energy Efficiency Standards for New Construction, Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities, and in accordance with applicable local codes. Obtain all necessary permits and have all work inspected by appropriate authorities.

B. All products shall be designed, manufactured, and tested in accordance with industry standards. Where applicable, products shall be labeled or listed by third party certification agencies. Standards organizations, and their abbreviations as used hereafter, include the following:

1. American National Standards Institute, Inc. (ANSI).
2. American Society for Testing and Materials (ASTM).
3. Insulated Cable Engineers Association (ICEA).
4. National Electrical Manufacturers Association (NEMA).
5. National Fire Protection Association (NFPA).
6. Underwriters Laboratories (UL).

1.6. SUBMITTALS

A. Make all submittals in accordance with the requirements of Division I. Approval drawings consist of shop drawings, product data, and other information as noted in the individual equipment sections. Except as noted, submittal information is for approval and equipment may not be installed until submittals have been returned with stamped approval.

B. Product data shall include, for each item, the manufacturer, manufacturer's catalog number, [California State listing number] type of class, the rating, capacity, size, etc. Submittals shall include:

1. Fixture Cuts.

2. Disconnect Switches.

3. Panelboards.

4. Wire and Cable.

5. Conduit and Fittings.

6. Boxes and Covers.

7. Switchgear.

8. Meter Center

C. Fixture Cuts: Contractor shall submit a brochure containing catalog cuts or drawings and data for all the lighting fixtures he proposes to furnish. For fixtures which the contractor proposes to substitute for those specified, he shall submit complete photometric data prepared by a recognized, approved testing laboratory, manufacturer's data sheets or drawings showing dimensions, construction, materials and finishes, and when required, sample fixtures.

D. Except as noted, installation instructions are not required to be submitted. However, it is the Contractor's responsibility to obtain installation information from the manufacturer for all equipment prior to installing the equipment.

E. Substitution: Only one substitution for each type of equipment or material will be considered.

F. After submittals are rejected the second time the contractor shall incur all engineers review time for third submittal @ $65.00/per hour; 8 hours minimum.

1.7. DRAWINGS

A. The electrical drawings, which constitute an integral part of this contract, shall serve as the working drawings. They indicate diagrammatically the general layout of the complete electrical system, including the arrangement of feeders, circuits, outlets, switches, controls, panelboards, service equipment, fixtures, special systems, and other work. Field verifications of scale dimensions taken from the drawings are directed since actual field locations, distances and elevations will be governed by actual field conditions. Review architectural, structural, mechanical and plumbing drawings and adjust work to conform to all conditions indicated thereon.

Discrepancies shown on different plans or between plans and actual field conditions, or between plans and specifications, shall promptly be brought to the attention of the Architect for a decision prior to installation of equipment in question. If discrepancies are not brought to the attention of the Architect prior to installation of said equipment the Contractor, if so directed, will move, remove or modify said equipment at no additional cost.

1.8. RECORD DRAWINGS

A. Furnish record drawings in accordance with the requirements of Division 1. Record drawings consist of submittal data as listed above, operation and maintenance data, and as built drawings. Record drawings are to reflect the final installation including any changes during approval, manufacturing tests, and installation.

B. In addition to other required sets, furnish one set of operation and maintenance data for all apparatus requiring service. This set is to be bound in hardback, three ring binder (s) located in a hinged metal cabinet in the main electrical room and shall include:

1. Title page with project name; installing contractor's name, address, and telephone number; date of installation and warranty period.

2. Index sheet.

3. Complete manufacturers operation and maintenance data with tabs (corresponding to the index) separating each item or system. Include the name, address, and phone number of the nearest sales and service organization for each item.

C. As-Built Drawings: Furnish one set of prints maintained at the job site at all times with all changes during construction marked thereon. Include on the as-built drawings sufficient dimensions to permit location of underground conduits.

D. Submit the results of any tests required in the individual equipment sections.

1.9. SERIES CONNECTED RATINGS

A. Combinations for series connected interrupting ratings shall be recognized by Underwriters Laboratories and shall appear in the Recognized Component Directory under the "Circuit Breakers-Series Connected" product category DKSY2. Current limiting circuit breakers shall allow the use of branch circuit breakers with lower interrupting capacities on systems capable of delivering fault currents which are higher than these capacities.

1.10. DELIVERY, STORAGE, AND HANDLING

A. Ship products to the job site in their original packaging. Receive and store products in a suitable manner to prevent damage or deterioration. Keep equipment upright at all times.

B. Investigate the spaces through which equipment must pass to reach its final destination. Coordinate with the manufacturer to arrange delivery at the proper stage of construction and to provide shipping splits where necessary.

## PART 2 - PRODUCTS

A. MATERIALS

1. Provide only new products of the manufacturer's latest design.

## PART 3 - EXECUTION

3.1. INSTALLATION

A. The complete installation is to be accomplished by skilled electrical tradesmen with certified or suitably qualified individuals performing all special systems installation and testing. All workmanship shall be of the highest quality; sub-standard work will be rejected.

B. Schedule the work and cooperate with all trades to avoid delays, interferences, and unnecessary work. If any conflicts occur necessitating departures from the Contract Drawings and specifications, details of departures and reasons therefore shall be submitted immediately for the Architect's consideration.

C. Do not allow installations to be concealed or enclosed before they have been inspected and tested. Should work be concealed before it has been inspected and tested, uncover at no additional cost, repairing as necessary after inspection.

D. Electrical License Requirements

1. No person shall perform electrical work on the contract without possessing an Arkansas State Master or Journeyman License from the Arkansas State Electrical Examiners Board. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one to one ratio.

2. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.

3.2. CERTIFICATION AND TESTS

A. Prior to request for final review test all systems and repair or replace all defective work. Submit, with request for final review, written certification that all electrical systems are complete and operational.

B. At the time of final review of electrical work, demonstrate the operation of electrical systems. Furnish labor, apparatus and equipment for systems' demonstration.

C. After final review and acceptance, turn over to the Owner all keys for electrical equipment locks. Present to the Owner or his designated representative

demonstrations and oral instructions for proper operation and maintenance of the electrical equipment and systems.

**END OF SECTION 16000**

# SECTION 16111-CONDUIT

# PART 1 - GENERAL

1.1. WORK INCLUDED

A. Rigid metal conduit and fittings, intermediate metal conduit and fittings, electrical metallic tubing and fittings, flexible metal conduit and fittings, liquid-tight flexible metal conduit and fittings, non-metallic conduit and fittings.

B. In group “R” construction conduit is not required when using type “NM” (Romex) except for panel feeders and services.

1.2. RELATED WORK

A. Cutting and patching, and sheet metal flashing and trim.

1.3. SUBMITTALS

A. Submit product data.

# PART 2 - PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

A. Conduit: Allied, Republic, Triangle, and Wheatland.

B. PVC Conduit: Amoco, Carlon, and Certainteed.

C. Flexible Conduit: Anaconda and Electric Flex.

D. Fittings: Regal, Bridgesport, and Madison.

E. Substitutions: Accepted equal to those listed above.

2.2. RIGID METAL CONDUIT AND FITTINGS

A. Rigid Steel Conduit: ANSI C80.1, U.L.-6; hot dip galvanized. Minimum size 3/4".

B. PVC Externally Coated Conduit: NEMA RN 1; rigid steel conduit with factory applied external 40 mil PVC coating and internal galvanized surface. Prior to coating, treat conduit with a heat polymerizing adhesive so the bond between metal and coating is greater than the tensile strength of the coating. Minimum size 3/4".

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; zinc coated; taper-threaded type, material to match conduit.

2.3. ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. EMT: U.L. 797, ANSI C80.3; hot dip galvanized mild strip steel. Minimum size 1/2".

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; die-cast, set screw or compression type.

2.4. FLEXIBLE METAL CONDUIT AND FITTINGS

A. Conduit: FS WW-C-566; single steel continuous strip with galvanized coating. Minimum size 3/8".

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; die-cast, set screw or compression type.

2.5. LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

A. Conduit UL listed U.A. type liquid tight consisting of an extruded thermoplastic cover over a galvanized steel core. Minimum size 3/4".

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; galvanized steel compression type with O-ring.

2.6. RIGID NONMETALLIC CONDUIT AND FITTINGS

A. Conduit: NEMA TC 2; Schedule 40 PVC. Minimum size 3/4".

B. Fittings and Conduit Bodies: NEMA TC 3.

2.7. [MC CABLE FITTINGS]

A. [Fittings and Conduit Bodies: ANSI/NEMA FB 1; die-cast, set screw or compression type. MC connector with reduced opening to prevent cable sheath from cutting insulation.]

2.8. CONDUIT SIZES

A. Unless otherwise indicated, size conduit according to Chapter 9, Tables 3A or 3B of the NEC.

## PART 3 - EXECUTION

3.1. CONDUIT SCHEDULE

A. Except as noted, use only rigid steel conduits with jacketed flexible steel conduit for connections to motors, transformers, or vibrating equipment.

B. EXCEPTIONS:

1. EMT may be used where concealed in spaces above hung ceilings and in hollow spaces of interior partitions. EMT may continue exposed in mechanical and electrical closets or rooms intended solely for mechanical and electrical use. EMT may be used in exposed areas above 12' AFF.

2. Non-jacketed flexible steel conduit may be used in lengths of not more than 6' for connections to lighting fixtures in suspended ceilings.

3. Schedule 40 PVC may only be used below grade or slab. Use rigid steel elbows to transition PVC out of slab. **[**Exceptions: PVC may enter switchboards, or

other floor standing electrical equipment enclosures**]**, **[**PVC may be used in slabs above grade.**]**

3.2. CONDUIT ARRANGEMENT AND SUPPORT

A. Arrange conduit to maintain headroom and present a neat appearance. Run exposed conduits parallel or perpendicular to building surfaces and adjacent piping. Group conduit in parallel runs where practical and provide rack space for 10 percent additional conduits. Use concentric bends for parallel runs.

B. Avoid sources of heat when possible. Where unavoidable, maintain 3" clearance when crossing hot pipes and 12" clearance between parallel hot pipes, flues, heating appliances, and other heat sources.

C. Support conduits to prevent distortion of alignment by wire pulling operations. Fasten single conduits with one hole malleable iron straps. (Exception: stamped steel straps okay for 1/2"; 3/4" conduits.) For multiple runs, use galvanized steel channel and clamps. Wire, perforated pipe straps and the like are not acceptable support means.

D. Support conduit at a maximum of 7' on center and within 3' of each box, cabinet, or fitting. Hang trapeze assemblies with threaded rods not less than 3/8" diameter. Remove all temporary supports prior to pulling conductors.

## 3.3. CONDUIT INSTALLATION

A. Cut conduit square using a saw or pipecutter and de-burr cut ends. Paint threads with zinc compound. Bring conduit to the shoulder of fittings and couplings and fasten securely. All connections are to be wrench tightened and electrically continuous. No running threads are permitted.

B. Use conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations. Use conduit bodies to make sharp changes in direction. For sizes 2" and larger, use "LB" or similar fittings to permit a straight pull from either direction.

C. The maximum length between pull points is 360'. This length shall be reduced by one foot for each degree of bend.

D. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2" size. Crushed or deformed conduits may not be installed.

E. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

F. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture. Install threaded PVC end caps on conduits stubbed up for future use.

G. Provide a 200 pound tensile strength polyolefin line pulled through and tied off at each end of all empty conduits.

H. Install expansion joints where conduit crosses building expansion or seismic joints and for straight runs in excess of 100 feet. Structural members shall in no case be drilled, bored or notched in such a manner that it will impair their structural value. Cut holes, if required, with core drill and only with approval of Architect.

I. Where conduit penetrates fire-rated ceilings, walls and floors, seal with Metacaulk #835 brand fire barrier penetration sealing system equal to U.L. #14TWL 1001 to maintain the fire integrity of the surface being penetrated. Equal method approved by Architect may be permitted as long as the complete system is a U.L. listed fire stop system. Use of a U.L. listed assembly entails using a U.L. listed caulk installed in a manner which is listed for the wall construction used. This includes spacing around conduit, thickness of bead etc. Low voltage wiring not installed in conduit must be sleeved to 6" from each side of wall and caulked inside and out.

J. In locations where the conduit cannot be turned, provide neoprene gasketed, split couplings. Provide clamp backs for conduits on exterior or damp surfaces to prevent the raceway from bearing directly on the damp surface.

K. Provide conduit sleeves and chases wherever conduits pass through walls or floors. Sleeves or chases are not required where conduits pass through "slab-on-grade". **[**Route conduits in slabs above the bottom reinforcing and below the top reinforcing. Maximum size for conduits in slabs above grade is 1". Route so conduits in slabs above grade do not cross.**]**

L. Use rigid steel long sweep elbows for bends in plastic conduit runs longer than 100', or in plastic conduit runs which have more than two bends regardless of length. Use rigid steel elbows to transition PVC out of slab.

M. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.

3.4. UNDERGROUND CONDUIT INSTALLATION

A. Installation: The top of the conduit shall be not less than 24" below grade with plastic warning tape 18" below finished grade, shall have a minimum slope of 3" in each 100' away from buildings and shall run in straight lines except where a change or direction is necessary. As each conduit run is completed, a testing mandrel not less than 12" long with a diameter 1/4" less than the inside diameter of the conduit shall be drawn through until the conduit is clear of all particles of earth, sand or gravel; conduit plugs shall than immediately be installed. There shall be not less than 3" clearance from the conduit to each side of the trench. The bottom of the trenches shall be graded smooth; where rock, soft spots, and/or sharp-edged materials are encountered, the bottom shall be excavated for an additional 3", filled and tamped level with the original bottom with sand or earth free from particles, that would be retained on a 1/4" sieve.

3.5. **[**UNDERGROUND DUCT BANK INSTALLATION

A. Install top of duct bank minimum 24 inches below finished grade with plastic warning tape 18 inches below finished grade.

B. Install conduit with minimum grade of 4 inches per 100 feet.

C. Terminate conduit in end bell at manhole entries.

D. Stagger conduit joints in concrete encasement 6 inches minimum.

E. Provide minimum 3 inch concrete cover at bottom, top, and sides of duct bank. Use suitable separators and chairs installed not greater than 4 feet on centers to provide

2 inch minimum conduit separation. Securely anchor conduit to prevent movement during concrete placement.

F. Provide two No. 4 steel reinforcing bars in top of bank under paved areas.

G. Use 1500 psi concrete with red oxide color additive.

H. Where duct bank passes beneath footings or slabs resting on grade excavate to provide a minimum of six inches clearance between the conduits and the structure. Backfill to the base of the structure with concrete.**]**

**END OF SECTION 16111**

# SECTION 16120-WIRE AND CABLE

## PART 1 - GENERAL

1.1. WORK INCLUDED

A. Building wire.

B. Cable.

C. Wiring connections and terminations.

1.2. SUBMITTALS

A. Submit product data.

1.3. PRODUCT USAGE

A. In group “R” buildings use Type “NM” for branch circuits.

B. In other buildings use conduit and wire as specified in this section.

## PART 2 - PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

A. Low Voltage Conductors: General Cable, Collyer, Pirelli, Southwire.

B. Signal Circuit Conductors: General Cable, West-Penn, Belden.

C. [MC Cable: Capital Wire and Cable (General Cable)]

D. Type NM Cable: Southwire

E. Low Voltage Connectors: Burndy, Thomas and Betts, Ideal, OZ, NSI Industries Polaris System.

F. Pulling Compounds: Ideal Yellow 77, Electro Y-ER-EAS, Minerallac 100, Burndy Slikon.

G. Substitutions: Accepted equal to those listed.

2.2. BUILDING WIRE

A. Thermoplastic-insulated Building Wire: NEMA WX 5, UL-83, Fed Spec JC-30A, ANSI C33.80.

B. Feeder and Branch Circuits: Single conductor, 98% conductivity copper, 75/90 degree C, 600 volt PVC insulated type THW or type THWN/THHN with nylon jacket. Minimum size #12 AWG.

C. Type NM-B: cable meets or exceeds UL Standard 83, UL Standard 719, Federal Specification A-A-59544, and requirements of the National Electrical Code. Cable is manufactured as 2, 3, or 4 conductor cable, with a ground wire. Copper conductors are annealed (soft) copper. Conductor insulation is 90°C-rated polyvinyl chloride (PVC), nylon jacketed. The cable jacket is color-coded for quick size identification; White - 14 AWG, Yellow - 12 AWG, Orange - 10 AWG, and Black - 8 AWG and 6 AWG.

D. Control Circuits: Same as specified above for feeder and branch circuits except minimum size #14 AWG.

2.3. REMOTE CONTROL AND SIGNAL CABLE

A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, rated 60 degree C, individual conductors twisted together, shielded, and covered with a PVC jacket; UL listed.

B. Control Cable for Class 2 or Class 3 Power Limited Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 80 degree C, individual conductors twisted together, shielded, and covered with a riser rated jacket, UL listed.

# PART 3 - EXECUTION

3.1. GENERAL WIRING METHODS

A. Use only stranded conductors. Exception: Solid conductors size #12 and #10 AWG may be used for receptacle branch circuit wiring.

B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 70 feet. Use 8 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 110 feet.

C. Place an equal number of conductors for each phase of a circuit in same raceway or cable.

D. Identification: All conductors shall be identified throughout the electrical system. For control and signal conductors use Brady or equal wire makers at all terminals and connection. Power circuit conductors shall have insulation color coded as follows:

| | |
|---|---|
| Phase A Phase B Phase C Neutral Ground | Black<br>Red Blue<br>White<br>Green |

# SECTION 16500

# LUMINAIRES AND ACCESSORIES

## PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The general provisions of the contract including General and Special Conditions and General Requirements shall apply to all work under this Section.

1.02 DESCRIPTION OF WORK

A. Provide luminaires and lamps as indicated on the drawings and in the fixture schedule and as required herein.

1.03 RELATED WORK IN OTHER SECTIONS

A. Related work in other sections:

| | | |
|---|---|---|
| 1. | Electrical General Provisions | Section 16010 |
| 2. | Raceways and Boxes | Section 16110 |
| 3. | Wire and Cable | Section 16120 |
| 4. | Wiring Devices | Section 16140 |
| 5. | Support Devices | Section 16190 |
| 6. | Electrical Identification | Section 16195 |

1.04 STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:
   1. Luminaires - UL 57, UL 1570, UL 1571, UL 1572, UL 676.
   2. Exit and Egress Luminaires - NFPA 70 and 101, UL 924.
   3. Ballasts - UL 936, UL 1029, CBM, ANSI C82-Ballasts.
   4. Lamp Holders and Starters - UL 496, UL 542, UL 879.
   5. Hazardous Location UL 1225, UL 1203, UL 506, UL 844, UL 886.
   6. Cords - UL 62.
   7. Metal Halide and Mercury Vapor Lamps - Federal Standard 21 CFR 1040.30.
   8. IES-SPI-NEMA Joint Standards for Class A and Class C acrylic compounds for plastic enclosures.
   9. Local code requirements.

1.05 SUBMITTALS

A. Submit shop drawings and manufacturers' data for the following items in accordance with the conditions of the contract and as specified below.
   1. Major luminaires and special luminaires shall show full-size cross sections. Indicate finished dimensions, metal thicknesses, and materials.
   2. Show mounting details, including hung ceiling construction.
   3. Indicate type of ballast and manufacturer and ballast quantity and location. Include information as to power factor, input watts, and ballast factor.
   4. Indicate lamps to be utilized and quantity and submit photometry. Where the lamps to be utilized and/or the ballasts are other than ones which published photometric data is available for, additional test data shall be submitted to the

engineer. These tests shall be performed by a certified independent testing laboratory or approved equal.

5. Shop drawings shall include a complete listing of all luminaires on a single sheet. This listing shall contain the luminaire type, manufacturers' catalog number, applied voltage, lamps, ballast type and luminaire quantities.
6. The Architect/Engineer reserves the right to require submittal of a complete sample fixture for any fixture type.

## PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Luminaires
   1. Acceptable manufacturers are listed in the lighting fixture schedule shown on the Drawings.
   2. The designations indicated on the lighting fixture schedule are a design series reference (not necessarily a complete catalog number) and do not necessarily represent the number, size, voltage, wattage, type of lamp, ballast, finish trim, ceiling type, mounting hardware of special requirements as specified hereinafter on as required by the particular installation(s) and code. Contractor shall verify these requirements and other fixtures as required to give proper installation per the contract documents and per codes.

B. Ballasts
   1. It is preferred that all ballasts shall be of the same manufacturer. Every effort shall be made to eliminate ballasts from multiple manufacturers. Ballasts within luminaires of a given type must however be of the same manufacturer. Multiple manufacturers will not be permitted.
   2. Approved Manufacturers:
      a) Motorola
      b) Advance Transformer Co.
      c) Magnetek
      d) General Electric

C. Lamps
   1. All lamps shall be of the same manufacturer. Multiple manufacturers are not permitted.
   2. Approved Manufacturers:
      a) General Electric
      b) Philips
      c) Osram Sylvania

D. Tube Guards
   1. McGill Manufacturing Company

2.02 FIXTURE QUALITY AND DESCRIPTION

A. Manufacture luminaires to the specifications described herein and on the drawings.

2.03 FABRICATION

A. Provide luminaires, complete factory-assembled and wired and equipped with necessary sockets, ballasts, wiring, shielding, reflectors, channels, lenses, etc., and deliver to job ready for installation.

2.04 MATERIALS

A. Plastic Lenses and diffusers:
   1. Virgin acrylic unless otherwise noted. De-staticize after cleaning. Install and leave with no finger prints or dirt marks on the lens or diffuser. Use white gloves if necessary. Lenses shall be provided on all recessed metal halide luminaires.
   2. Minimum unpenetrated thickness for Parabolic or conical element diffuser: 0.085 inch.
   3. Minimum nominal thickness: 0.125 inch.

B. Parabolic Luminaire Care: Parabolic luminaires to be installed with mylar cover over louvers. Cover shall be U.L. listed for temporary lighting. Upon completion of work, remove mylar cover with white gloves and blow clean reflectors.

C. Finish: Porcelain or baked enamel finish matte white on interiors with minimum tested reflectance of 90 percent matte white finish or as specified in visible exterior. Thoroughly clean base metal and bonderize after fabrication.

D. Sockets: Incandescent lamp sockets - porcelain housings over copper screw shells, with medium base sockets rated at 660 watts and 250 volts. Insulating joint in pull chains. Fluorescent lampholder - white, heat-resistant plastic rated 660 watts and 600 volts. Fluorescent industrial sockets - heavy-duty, multi-socket, metal-clad, spring-loaded. Provide heavy-duty sockets for H.I.D. luminaires where mounted less than 8'-0" AFF.

E. Luminaire Wiring: Minimum individual luminaire wiring - number 18 gauge with insulation at rated operating temperature of 105 degrees Centigrade or higher. Terminate wiring for recessed luminaires, except fluorescent units, in an external splice box.

F. Ballasts
   1. Ballasts for F32T8 lamps shall be:
      a) High frequency solid state electronic.
      b) Instant start, parallel operation.
      c) 50 F minimum starting temperature unless otherwise noted
      d) Minimum 0.87 ballast factor
      e) Maximum total harmonic distortion (THD) 10%
      f) High power factor, minimum 95 %
      g) Sound rated A
   2. High-power factor (over 90 percent). Certified Ballast Manufacturers' Certification, ballast case temperature not to exceed 90 degrees Centigrade during normal operation in 30 degrees Centigrade ambient temperature. Ballast voltage: 120 or 277 volts, as required by circuiting. Ballast shall be provided with the best sound rating available.
   3. Built-in self-resetting thermal actuated device will remove ballast from line when excessive ballast temperature is reached. U.L. Class P, CBM certified 100% output.
   4. The conductors between ballasts and lampholders shall have an approved insulation for 1,000 volts. This includes conductors to and from remote ballasts.
   5. High-intensity discharge ballasts shall be constant wattage autotransformer type with built-in thermal protection, minimum power factor of 80%. 12" min. leads.
   6. Provide ballasts with voltage characteristics to match that of all related circuitry indicated on the Drawings. No extra compensation will be allowed for failure to properly coordinate ballast voltage with circuitry.

7. Ballasts for control of lamps in one housing or fixture unit shall not control lamps of an adjoining unit, except as otherwise noted.
8. Guarantee ballast for one full year and one year prorated as per standard manufacturer's warranty against defects for a period of 2 years. Guarantee to include replacing defective ballast with new ballast.
9. Provide dimming ballasts as required for fixtures controlled by individual dimming or dimming systems.

G. Lamps
1. Provide a complete set of new lamps in each fixture.
2. Unless noted otherwise lamps must conform to the following:
a) Fluorescent: T-8, 35k color.
b) Incandescent: "A" lamps to be inside frosted rated at 130 volts.
c) Low voltage: MR-16.

H. Thermal Protection
1. Recessed incandescent luminaires shall be furnished with thermal protection.

I. Tube Guards
1. Where installed outdoors, in garage areas or in spaces open to the out of doors, provide each fluorescent lamp with an OSHA approved tube guard as manufactured by the McGill Manufacturing Company. Tube shall have 96% transmission properties.

J. Luminaires installed recessed in a metal pan ceiling shall have a flange type trim to overlap abutment of adjacent pans.

K. Where utilized as raceways, luminaires shall be suitable for use as raceways. Provide feed through splice boxes where necessary.

## PART 3 - EXECUTION

3.01 INSTALLATION

A. Architect's and/or interior designers reflected ceiling plans show actual location of luminaires. Report to the Architect/Engineer any conflict between these plans and the electrical documents. Perform the work in accordance with the Architects/Engineers' instructions. At the time of bid, include the most stringent requirement.

B. Install luminaires in mechanical and unfinished areas after ductwork and piping installation. Adjust fixture locations to provide the best lighting for equipment access and service locations. Locate fixtures 8 feet 6 inches above floor, or at suitable locations within space on walls but not lower than 7'-0" AFF.

C. The Contractor shall protect luminaires from damage during installation of same and up to time of final acceptance. Any broken luminaires, glassware, plastics, lamps, etc., must be replaced by the Contractor with new parts, without any additional expense to the Owner.

D. Where fluorescent luminaires are surface mounted. They shall be labeled for such and in minimum of one-half (1/2) inch air space shall be maintained between top of luminaire and mounting surface by an approved means.

E. Pendant mounted units shall comply with the following:
1. Each stem shall have a brass or steel swivel of other self-aligning device of type approved by the Architect/Engineer. The entire luminaire mounting (hickey,

aligner, swivel, stem, etc.) shall be submitted to and approved by the Architect/Engineer before installation.
2. An insulated malleable iron bushing shall be placed at luminaire end of stem through which wire passes.
3. A pendant support using an approved sliding clevis bracket which firmly grips an indentation in rigid sides of the wiring channel will be acceptable.
4. Connections between outlet boxes and luminaires shall be by means of approved flexible raceways. The application of raceways directly between luminaires is unacceptable.

F. Where luminaires are mounted upon surface-mounted outlet boxes in surface mounted conduit runs, this Contractor shall furnish and install a luminaire canopy sufficiently deep to permit exposed conduits to pass through. Canopy shall have proper openings cut by luminaire manufacturer through which conduits may pass. Submit sample of canopy for approval before installation.

G. Prior to final payment, clean all luminaires and replace all expended lamps. Touch up all scratch marks, etc., in an approved manner.

H. Where ballasts are found to be producing excessive noise they shall be replaced.

I. Install exit light as indicated on the drawings but not higher than 10'0" AFF. Size and color of lettering shall comply with local codes.

J. Track luminaires, Adjustable luminaires, Floodlights and Accent lights shall be aimed as directed by the Architect/Engineer. Outdoor lighting shall be aimed in periods of darkness.

K. Recessed luminaires to be installed in metal pan or acoustic modular ceilings shall be modified as required to fit into openings in ceiling construction. This contractor shall coordinate and verify this work with the General Construction Contractor. Shop drawings showing details shall be submitted for approval.

L. Plumb all outdoor lighting standards to true vertical. For bolted poles, provide galvanized anchor bolts and nuts. Plumb using a nut above and below the base plate on the anchor bolts. Pack grout between base plate and concrete footing and provide drain hole below base plate to prevent accumulation of moisture inside pole base. Provide two piece or individual covers for nuts exposed above the baseplate of the same color as the pole. Ground all metal lighting standards.

3.02 COORDINATION WITH MOUNTING CONDITIONS

A. This Contractor is responsible for coordinating the mounting accessories and luminaire trims with the ceiling conditions for which each luminaire will be installed. No extra compensation will be permitted for failure to coordinate.

B. All luminaires in hung ceilings are to be installed with earthquake clips.

3.03 COORDINATION WITH AMBIENT CONDITIONS

A. The Contractor is responsible for coordinating the characteristics and the U.L. labeling of the luminaires and their components with the ambient conditions which will exist when the luminaires are installed. No extra compensation will be permitted for failure to coordinate the luminaires with their ambient conditions. These areas of coordination include but are not limited to the following:
1. Wet location labels
2. Damp location labels
3. Low temperature ballasts

4. Dimming ballasts
5. Very low heat rise ballasts
6. Explosion proof
7. Plenums and air handling spaces
8. Fire rated ceilings
9. Low density ceilings
10. Insulated ceilings

-- End of Section --