December 7, 2005

# PROJECT MANUAL

# HAVEN HOSPICE OF THE SUWANNEE VALLEY

## Lake City, Florida

for The Haven Hospice of North Central Florida
**Gainesville, Florida**

PROJECT TEAM

**Haven Hospice of North Central Florida**

**Haven Hospice of the Suwannee Valley**

**AvMed SantaFe Design & Construction Services**
Owner's Representative

**M.M. Parrish Construction Co.**
Construction Manager

Brame Architects

606 N.E. First Street
Gainesville, Florida 32601
Phone (352) 372-0425 • FAX (352) 372-0427

**Campbell Engineering of North Florida, Inc.**
Consulting Mechanical/Plumbing/Electrical Engineers
8813
Phone (352) 372-6967• FAX (352) 372-7232

**Causseaux & Ellington, Inc.**
Consulting Civil Engineers
EB-5075
Phone (352) 331-1976 • FAX (352) 331-2476

**Sputo and Lammert Engineering**
Consulting Structural Engineer
P.E. Number 39142
CA-6855
Phone (352) 378-0448 • FAX (352) 373-1331

**Buford Davis & Associates**
Consulting Landscape Architect
Phone (352)335-1896 • FAX (352)373-6407

**File No. 5138.010-05**

**SET NO.** 5

# TABLE OF CONTENTS

## CONTRACTUAL CONDITIONS


A Contract Specifications and Drawings .....A-1 thru A-2


## TECHNICAL SPECIFICATIONS


| Section | Description | Page Numbers |
|---|---|---|
| **DIVISION 1 - GENERAL REQUIREMENTS** | | |
| 01010 | Summary of the Work | 01010-1 |
| 01310 | Schedules, Reports, Payments | 01310-1 thru 01310-5 |
| 01340 | Shop Drawings, Product Data and Samples | 01340-1 thru 01340-4 |
| 01400 | Standards and Quality Control | 01400-1 thru 01400-5 |
| 01500 | Temporary Facilities | 01500-1 thru 01500-7 |
| 01631 | Products and Substitutions | 01631-1 thru 01631-6 |
| 01700 | Project Closeout | 01700-1 thru 01700-6 |
| **DIVISION 2 - SITE WORK** | | |
| 02110 | Site Preparation and Layout | 02110-1 thru 02110-2 |
| 02200 | Earthwork | 02200-1 thru 02200-11 |
| 02230 | Site Clearing | 02230-1 thru 02230-4 |
| 02260 | Excavation Support and Protection | 02260-1 thru 02260-4 |
| 02282 | Termite Control | 02282-1 thru 02282-3 |
| 02511 | Hot-Mix Asphalt Paving | 02511-1 thru 02511-9 |
| 02630 | Storm Drainage | 02630-1 thru 02630-7 |
| 02668 | Domestic Water Systems and Pressurized Sanitary Sewage Force Mains | 02668-1 thru 02668-9 |
| 02730 | Sanitary Sewage System | 02730-1 thru 02730-9 |
| 02750 | Underground Irrigation Systems | 02750-1 thru 02750-6 |
| 02751 | Cement Concrete Pavement | 02751-1 thru 02751-11 |
| 02800 | Landscape | 02800-1 thru 02800-11 |
| **DIVISION 3 - CONCRETE** | | |
| 03310 | Concrete Work | 03310-1 thru 03310-13 |
| **DIVISION 4 - MASONRY** | | |
| 04810 | Unit Masonry Assemblies | 04810-1 thru 04810-13 |
| 04815 | Glass Unit Masonry Assemblies | 04815-1 thru 04815-5 |

| Section | Description | Page Numbers |
|---|---|---|
| **DIVISION 5 - METALS** | | |
| 05500 | Metal Fabrications | 05500-1 thru 05500-3 |
| **DIVISION 6 - CARPENTRY** | | |
| 06100 | Rough Carpentry | 06100-1 thru 06100-3 |
| 06176 | Metal-Plate-Connected Wood Trusses | 06176-1 thru 06176-5 |
| 06200 | Finish Carpentry | 06200-1 thru 06200-7 |
| **DIVISION 7 - MOISTURE PROTECTION** | | |
| 07200 | Building Insulation | 07200-1 thru 07200-2 |
| 07311 | Asphalt Shingles | 07311-1 thru 07311-4 |
| 07460 | Siding | 07460-1 thru 07460-4 |
| 07600 | Aluminum Gutters and Downspouts | 07600-1 thru 07600-2 |
| 07900 | Joint Sealers | 07900-1 thru 07900-4 |
| **SECTION 8 - DOORS, WINDOWS & GLASS** | | |
| 08110 | Steel Doors and Frames | 08110-1 thru 08110-4 |
| 08200 | Flush Wood Doors | 08200-1 thru 08200-5 |
| 08211 | Composite Wood Doors | 08211-1 thru 08211-2 |
| 08710 | Finish Hardware | 08710-1 thru 08710-19 |
| 08800 | Glazing | 08800-1 thru 08800-7 |
| 08920 | Aluminum Windows | 08920-1 thru 08920-4 |
| **DIVISION 9 - FINISHES** | | |
| 09220 | Portland Cement Plaster | 09220-1 thru 09220-5 |
| 09260 | Gypsum Board Assemblies | 09260-1 thru 09260-8 |
| 09300 | Tile | 09300-1 thru 09300-9 |
| 09511 | Acoustical Panel Ceilings | 09511-1 thru 09511-4 |
| 09650 | Resilient Flooring | 09650-1 thru 09650-5 |
| 09652 | Sheet Vinyl Floor Coverings | 09652-1 thru 09652-6 |
| 09680 | Carpeting | 09680-1 thru 09680-5 |
| 09900 | Painting | 09900-1 thru 09912-11 |


SPUTO AND LAMMERT
ENGINEERING, LLC
STRUCTURAL ENGINEERS
10 SW 1ST AVE, GAINESVILLE, FL 32601
PHONE: 352-378-0440
THOMAS SPUTO, PH.D., P.E.
FLORIDA PE # 39142 CA # 6955

19 Dec 07

12/19/07

Section Description Page Numbers

**DIVISION 10 - SPECIALTIES**


| | | |
|---|---|---|
| 10150 | Miscellaneous Specialties | 10150-1 thru 10150-2 |
| 10160 | Toilet Partitions | 10160-1 thru 10160-4 |
| 10350 | Flagpoles | 10350-1 thru 10350-4 |
| 10522 | Fire Extinguishers, Cabinets and Accessories | 10522-1 thru 10522-2 |
| 10652 | Folding Panel Partitions | 10652-1 thru 10652-4 |
| 10800 | Toilet Accessories | 10800-1 thru 10800-3 |


**DIVISION 11 - EQUIPMENT**


| | | |
|---|---|---|
| 11400 | Foodservice Equipment | 11400-1 thru 11400-8 |


**DIVISION 12 - FURNISHINGS**

Not Used

**DIVISION 13 - SPECIAL CONSTRUCTION**

Not Used

**DIVISION 14 - CONVEYING SYSTEMS**

Not Used

12/19/18

Section Description Page Numbers

## DIVISION 15 - MECHANICAL


| | | |
|---|---|---|
| 15005 | Mechanical General | 15005-1 thru 15005-9 |
| 15020 | Codes and Standards | 15020-1 thru 15020-2 |
| 15030 | Mechanical Related Work | 15030-1 thru 15030-4 |
| 15105 | Pipes and Pipe Fittings | 15105-1 thru 15105-4 |
| 15110 | Valves | 15110-1 thru 15110-5 |
| 15120 | Piping Specialties | 15120-1 thru 15120-3 |
| 15140 | Meters and Gauges | 15140-1 thru 15140-3 |
| 15150 | Supports, Anchors, and Seals | 15150-1 thru 15150-5 |
| 15160 | Mechanical Identification | 15160-1 thru 15160-4 |
| 15170 | Access Doors | 15170-1 thru 15170-2 |
| 15180 | Testing, Cleaning, and Sterilization of Piping Systems | 15180-1 thru 15180-2 |
| 15190 | Excavation and Backfill | 15190-1 thru 15190-2 |
| 15205 | Insulation for Plumbing Equipment and Piping | 15205-1 thru 15205-3 |
| 15210 | Insulation for HVAC Equipment and Piping | 15210-1 thru 15210-2 |
| 15230 | Exterior Insulation for Ductwork | 15230-1 thru 15230-2 |
| 15340 | Building Sprinkler and Standpipe Systems | 15340-1 thru 15340-3 |
| 15405 | Potable Water System | 15405-1 thru 15405-6 |
| 15410 | Soil, Waste and Vent System | 15410-1 thru 15410-6 |
| 15430 | Plumbing Fixtures, Equipment, Trim & Schedule | 15430-1 thru 15430-13 |
| 15440 | Gas System | 15440-1 thru 15440-5 |
| 15455 | Medical Gas Systems | 15455-1 thru 15455-7 |
| 15457 | Medical Vacuum System | 15457-1 thru 15457-6 |
| 15475 | Plumbing Pumps | 15475-1 thru 15475-3 |
| 15700 | Outside Air Preconditioning Units | 15700-1 thru 15700-4 |
| 15710 | Split System Air Conditioning Units | 15710-1 thru 15710-4 |
| 15715 | Ductless Split System Air Conditioning Units | 15715-1 thru 15715-3 |
| 15750 | Electric Heaters | 15750-1 thru 15750-4 |
| 15720 | Packaged Terminal Air Conditioners | 15720-1 thru 15720-2 |
| 15810 | Fans | 15810-1 thru 15810-4 |
| 15820 | Cooking Hood Packaged System | 15820-1 thru 15820-6 |
| 15840 | HVAC Metal Ductwork | 15840-1 thru 15840-6 |
| 15855 | Ductwork Accessories | 15855-1 thru 15855-5 |
| 15860 | Grilles, Registers and Ceiling Diffusers | 15860-1 thru 15860-3 |
| 15875 | Wall Louvers | 15875-1 thru 15875-2 |
| 15905 | HVAC Controls and Sequence of Operation | 15905-1 thru 15905-2 |
| 15925 | Energy Management Control and DDC System - Additive Alternate | 15925-1 thru 15925-8 |
| 15970 | Startup Requirements for HVAC Systems | 15970-1 thru 15970-2 |
| 15985 | Testing and Balancing of Mechanical Systems | 15985-1 thru 15985-5 |


12/19/05

Arthur L. Campbell, III, PE
PE No. 13153
DIV 15
Campbell Engineering
of North Florida, Inc.
2209 NW 40th Terrace, Suite A PHONE: 352/372-6967
Gainesville, Florida 32605 FAX: 352/372-7232
Lic. No. 00008813

Section Description Page Numbers

## DIVISION 16 - ELECTRICAL


| | | |
|---|---|---|
| 16005 | Electrical General | 16005-1 thru 16005-9 |
| 16020 | Codes and Standards | 16020-1 thru 16020-2 |
| 16030 | Electrical Related Work | 16030-1 thru 16030-3 |
| 16034 | Reinforced Concrete Foundations for Electrical Equipment | 16034-1 thru 16034-4 |
| 16100 | Basic Materials and Methods | 16100-1 thru 16100-13 |
| 16101 | Conductor and Cable Identification | 16101-1 thru 16101-3 |
| 16102 | PVC Raceways | 16102-1 thru 16102-2 |
| 16103 | General Grounding Electrical Systems | 16103-1 thru 16103-2 |
| 16105 | Excavation and Backfill | 16105-1 thru 16105-2 |
| 16106 | Manholes and Handholes | 16106-1 thru 16106-2 |
| 16107 | Service Entrance Materials and Methods - Underground | 16107-1 thru 16107-2 |
| 16110 | Disconnect Switches | 16110-1 thru 16110-2 |
| 16112 | Fuses 600 Volts and Below | 16112-1 |
| 16120 | Circuit Breaker Enclosures | 16120-1 |
| 16125 | Circuit Breakers, Molded Case | 16125-1 thru 16125-3 |
| 16150 | Contactors | 16150-1 |
| 16155 | Relays | 16155-1 |
| 16160 | Time Switches | 16160-1 thru 16160-2 |
| 16165 | Photocell Control | 16165-1 |
| 16170 | General Wiring Devices | 16170-1 thru 16170-5 |
| 16171 | General Wiring Devices (Hospitals and Laboratories) | 16171-1 thru 16171-4 |
| 16200 | Emergency Light and Power System | 16200-1 |
| 16201 | Emergency Power Generation - Diesel Engine Driven | 16201-1 thru 16201-8 |
| 16207 | Automatic Transfer Switch | 16207-1 thru 16207-4 |
| 16410 | Low Voltage Switchboards, Group Mounted Devices | 16410-1 thru 16410-5 |
| 16412 | Electric Instrumentation | 16412-1 thru 16412-2 |
| 16420 | Panelboards | 16420-1 thru 16420-3 |
| 16450 | Transformers - Dry Type | 16450-1 thru 16450-2 |
| 16521 | Lighting Fixtures | 16521-1 thru 16521-3 |
| 16530 | Lighting Fixture, HID Lamp Type | 16530-1 thru 16530-2 |
| 16540 | Lighting Fixture Supports, Standards and Poles | 16540-1 thru 16540-2 |
| 16600 | Lightning Protection System - Class I Materials | 16600-1 thru 16600-3 |
| 16620 | Surge Protection - Secondary | 16620-1 thru 16620-2 |
| 16712 | Telephone, Computer, Television Systems | 16712-1 |
| 16721 | Door Monitoring System | 16721-1 thru 16721-3 |
| 16731 | Fire Detection and Alarm System - Addressable | 16731-1 thru 16731-6 |
| 16775 | Nurse Call System | 16775-1 thru 16775-3 |
| 16900 | Work Required for Equipment Furnished in Other Divisions | 16900-1 |


END TABLE OF CONTENTS

12/19/05

Kevin O'Kelley Campbell, PE
PE No. 55531
DIV 16
*Campbell Engineering*
*of North Florida, Inc.*
2209 NW 40th Terrace, Suite A PHONE: 352/372-6967
Gainesville, Florida 32605 FAX: 352/372-7232
Lic. No. 00008813

## SECTION A- CONTRACT SPECIFICATIONS AND DRAWINGS

**SPECIFICATIONS**: Broadly defined the specifications include all data bound together or referenced within the Project Manual, including Instructions to Bidders, Bid Form, List of Subcontractors Form, General Conditions, Supplementary Conditions, detailed Technical Specifications and all Addenda thereto. The Project Manual is entitled:

**HAVEN HOSPICE**
**OF THE SUWANNEE VALLEY**
**LAKE CITY, FL**
**FOR THE HAVEN HOSPICE OF NORTH CENTRAL FLORIDA**
**GAINESVILLE, FLORIDA**
**(5138.010)**

The Project Manual is dated December 7, 2005 The contents are as shown in the Table of Contents.

**DRAWINGS**: The drawings, or reproductions thereof, pertain to the work to be performed and have been prepared or approved by the Architect/Engineer. The drawings consist of the following sheets dated December 7, 2005

| NUMBER | TITLE |
|---|---|
| I1.1 | COVER SHEET, INDEX OF DRAWINGS, AND LOCATION MAP |
| C0.00 | COVER SHEET (CIVIL) |
| CS1.00 | BOUNDARY AND TOPOGRAPHIC SURVEY |
| C0.10 | GENERAL NOTES AND LEGEND |
| C1.00 | HORIZONTAL CONTROL AND SITE PLAN |
| C2.00 | MASTER PAVING, GRADING, AND DRAINAGE PLAN |
| C2.10 | CONSTRUCTION DETAILS |
| C2.20 | STORMWATER POLLUTION PREVENTION PLAN |
| C2.21 | STORMWATER POLLUTION PREVENTION PLAN NOTES |
| C3.00 | UTILITIES SITE PLAN |
| C3.10 | WATER AND WASTEWATER DETAILS |
| C3.20 | SEPTIC TANK AND DRAINFIELD SITE PLAN AND DETAILS |
| A0.1 | ABBREVIATIONS, TYPICAL MOUNTING HEIGHTS, CONSTRUCTION AND SITE SIGNS, AND FIRE-RATED ASSEMBLIES |
| A1.1 | OVERALL ARCHITECTURAL FLOOR PLAN |
| A1.2 | FLOOR PLAN OF THE OFFICE BUILDING |
| A1.3 | FLOOR PLAN OF THE CARE CENTER |
| A1.4 | ENLARGED PARTIAL FLOOR PLANS |
| A2.1 | DOOR SCHEDULES, TYPES, AND FRAMES |
| A2.2 | WINDOW TYPES, DOOR AND WINDOW DETAILS |
| A2.3 | DOOR AND WINDOW DETAILS, ROOM FINISH SCHEDULES |
| A3.1 | BUILDING ELEVATIONS |
| A3.2 | BUILDING SECTIONS AND ELEVATIONS |
| A3.3 | BUILDING SECTIONS |
| A3.4 | BUILDING SECTIONS |
| A4.1 | WALL SECTIONS |

| NUMBER | TITLE |
|---|---|
| A4.2 | WALL SECTIONS |
| A4.3 | WALL SECTIONS |
| A4.4 | WALL SECTIONS |
| A4.5 | WALL SECTIONS; BOLLARD AND FLAGPOLE DETAILS |
| A5.1 | INTERIOR ELEVATIONS - OFFICE BUILDING |
| A5.2 | INTERIOR ELEVATIONS - CARE CENTER |
| A5.3 | INTERIOR ELEVATIONS AND KITCHEN EQUIPMENT SCHEDULE |
| A5.4 | ARCHITECTURAL CASEWORK DETAILS |
| A5.5 | ARCHITECTURAL CASEWORK DETAILS |
| A6.1 | REFLECTED CEILING PLAN |
| A6.2 | CEILING AND SOFFIT DETAILS |
| A7.1 | ARCHITECTURAL ROOF PLAN |
| A7.2 | ROOF DETAILS |
| A7.3 | ROOF DETAILS |
| S1.1 | STRUCTURAL FOOTING AND FRAMING DETAILS |
| S2.1 | STRUCTURAL FOUNDATION PLAN |
| S3.1 | STRUCTURAL ROOF FRAMING PLAN |
| S3.2 | STRUCTURAL ROOF TRUSS PROFILES |
| P1.1 | PLUMBING ABBREVIATIONS, LEGEND, NOTES, AND DETAILS |
| P2.1 | PLUMBING FLOOR PLAN - SANITARY |
| P2.2 | PLUMBING FLOOR PLAN - DOMESTIC HOT & COLD WATER & MED GASES |
| P3.1 | PLUMBING RISER & DETAILS |
| P3.2 | PLUMBING DETAILS |
| P4.1 | PLUMBING ENLARGED PLANS & DETAILS |
| FP1.1 | FIRE PROTECTION FLOOR PLAN |
| M1.1 | MECHANICAL ABBREVIATIONS, LEGEND, DETAILS, AND NOTES |
| M2.1 | MECHANICAL FLOOR PLAN |
| M3.1 | MECHANICAL SCHEDULES AND DIAGRAMS |
| M4.1 | MECHANICAL ENLARGED PLANS |
| M5.1 | MECHANICAL DETAILS |
| E1.1 | ELECTRICAL LEGEND, NOTES, AND ABBREVIATIONS |
| E3.1 | ELECTRICAL FLOOR PLAN - POWER AND SYSTEMS |
| E3.2 | ELECTRICAL FLOOR PLAN - LIGHTING |
| E3.3 | ELECTRICAL FLOOR PLAN - EQUIPMENT AND SYSTEMS |
| E4.1 | ELECTRICAL RISERS |
| E4.2 | ELECTRICAL SCHEDULES & DETAILS |
| E4.3 | ELECTRICAL SCHEDULES & DETAILS |
| E4.4 | ELECTRICAL SCHEDULES & DETAILS |
| E5.1 | ELECTRICAL SITE PLAN |

END OF SECTION A

## SECTION 01010 - SUMMARY OF THE WORK

### 1.0 GENERAL

Work described in this Project Manual and delineated on the Contract Drawings is for the construction one story office and care center building containing approximately 23,034 square feet, located in Lake City, Florida.

**BRIEF DESCRIPTION**: This project consists of a one story wood frame building with cementitious siding on load bearing walls, concrete monolithic footings, concrete floor slabs on grade, pre-engineered wood trusses, sloped plywood roof decks topped with shingles.

Site development includes storm water management, clearing for building, roads and parking areas, septic drain field, and landscaping.

Doors include prehung wood doors and frames, some metal doors and frames, and aluminum windows.

Finishes include exterior cementitious siding, wood studs and gypsum board, acoustical lay-in ceilings, carpet, ceramic tile, resilient tile, and interior/exterior paint.

Specialties include signs, bathroom accessories, and a movable partition.

The new building is to be heated and air-conditioned with a central system. Plumbing work includes fixtures, soil and waste system and hot and cold water distribution system. Patient Rooms to be air-conditioned by thru-wall packaged units.

Electrical work includes lighting and power for the new building.

END OF SECTION 01010

# SECTION 01310 - SCHEDULES, REPORTS, PAYMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

### 1.2 COORDINATION

A. Coordinate both the listing and timing of reports and other activities required by provisions of this and other sections, so as to provide consistency and logical coordination between the reports. Maintain coordination and correlation between separate reports by updating at monthly or shorter time intervals. Make appropriate distribution of each report and updated report to all parties involved in the work including the Architect/Engineer and Owner. In particular provide close coordination of the progress schedule, schedule of values, listing of subcontracts, schedule of submittals, progress reports, and payment requests.

### 1.3 PROGRESS SCHEDULE

A. Based on the preliminary development of the progress schedule, if any, and on whatever updating and feedback may have occurred during the project start-up, secure critical time commitments for performing major elements of the work. Within 30 days after the date established for "commencement of the work", submit a comprehensive bar-chart type progress schedule indicating, by stage-coded symbols, a time bar for each major category or unit of work to be performed at the site; include minor elements of work which are, nevertheless, involved in overall sequencing of the work. Arrange schedule to show graphically the major sequences of work necessary for the completion of related elements of work. Arrange the schedule to show how substantial completion is scheduled to allow for the Architect/Engineer's procedure for certification of substantial completion. Prepare and maintain the schedule on either a sheet of sufficient width (or else a series of sheets) to show the required data clearly for the entire Construction Time. Prepare the schedule on sheets of stable transparency, or other reproducible material, to permit reproduction for the required distribution.

1. COST CORRELATION: Immediately below the date line at the heading of the bar-chart, provide a two item cost correlation line, indicating both "precalculated" and "actual" costs. This cost correlation line shall show dollar-volume of work performed as of the same dates used for preparation of payment requests. Refer to subsequent article for cost reporting and payment procedures. Generally, use the same units of work in the progress schedule as indicated in the "schedule of values" required by the General Conditions and further specified herein.

    a. Superimpose an S-curve on the schedule to show the "precalculated" dollar-volume against time at any point during Contract Time. Provide a double column of figures in left hand margin; one column shall indicate a range from zero dollars to the Contract Sum, the other column shall indicate a percentage from zero to 100 percent. As the work progresses

and on each date used in payment requests, plot a second S-curve showing actual dollar-volume of work performed.

2. DISTRIBUTION: Following the initial submittal to and response by the Architect/Engineer, print and distribute progress schedules to the Architect/Engineer (3 copies), Owner, separate contractors, the principal subcontractors and suppliers or fabricators, and others with a need-to-know schedule-compliance requirement. Post copies in the project meeting room and temporary field office. When revisions are made, distribute updated issues to the same entities and post updated issues in the same locations. Delete entities from distribution when they have completed their assigned work and are no longer involved in the performance of scheduled work.

## 1.4 CONTRACTOR'S OBLIGATION TO COMPLY WITH SCHEDULE AND CONTRACT TIME

A. The Contractor shall furnish sufficient forces, construction plant and equipment and shall work such hours, including night shifts and overtime operations, as may be necessary to insure the prosecution of the work in accordance with the approved progress schedule. If the Contractor falls behind the progress schedule, the Contractor shall take such steps as may be necessary to improve his progress by increasing the number of shifts, overtime operations, days of work and the amount of construction plant, all without additional cost to the Owner.

1. Failure of the Contractor to comply with the requirements under this provision shall be grounds for determination by the Architect/Engineer that the Contractor is not prosecuting the work with such diligence as will insure completion within the time specified, and such failure constitutes a substantial violation of the conditions of the Agreement.
2. Upon such determination, the Owner may terminate the Contractor's right to proceed with the work, or any separable part thereof, in accordance with Article 14 of the AIA General Conditions.

## 1.5 PROGRESS MEETINGS, REPORTING

A. GENERAL: In addition to specific coordination and pre-installation meetings for each element of work, and other regular project meetings held for other purposes, hold a general progress meeting each month with time coordinated with preparation of the payment request. Require each entity then involved in planning, coordination or performance of work to be properly represented at each meeting. Review each entity's present and future needs including interface requirements, time, sequences, deliveries, access, site utilization, temporary facilities and services, hours of work, hazards and risks, housekeeping, change orders, and documentation of information for payment requests. Discuss whether each element of current work is ahead of schedule, on time, or behind schedule in relation with updated progress schedule. Determine how behind-schedule work will be expedited, and secure commitments from entities involved in doing so. Discuss whether schedule revisions are required to ensure that current work and subsequent work will be completed within Contract Time. Review everything of significance which could affect progress of the work.

1. PRECONSTRUCTION CONFERENCE: Before beginning work at the site, the General Contractor shall attend a preconstruction conference and shall

bring with him the superintendent employed for this project. Also, instruct the plumbing, mechanical and electrical subcontractors or their representatives to attend this meeting. At this time, all the parties concerned will discuss the project under contract and will prepare a program of procedure in keeping with the requirements of the drawings and specifications. The superintendent shall henceforth make every effort to expeditiously coordinate all phases of the work, including the required reporting procedure, to obtain the end result within the full purpose and intent of the drawings and specifications for the project.

2. REPORTING: Within 5 days after each progress meeting date, Architect/Engineer will distribute copies of minutes-of-the-meeting to each entity present and to others who should have been present.
3. SCHEDULE UPDATING: Immediately following each progress meeting, where revisions to progress schedule have been made or recognized, Contractor shall revise progress schedule. Reissue revised schedule concurrently with report of each meeting.

## 1.6 SCHEDULE OF VALUES

A. GENERAL: Prepare the schedule of values, as required by the General Conditions, in conjunction with the preparation of the progress schedule. Coordinate preparation of schedule of values and progress schedule. Correlate line items with other administrative schedules and the forms required for the work, including the progress schedule, payment request form, listing of subcontractors, schedule of allowances, schedule of alternates, listing of products and principal suppliers and fabricators, and the schedule of submittals. Provide breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of payment requests and progress reports. Break down principal subcontract amounts into several line items. Round off to the nearest whole dollar, but with the total equal to the Contract Sum.

1. TIME COORDINATION: In coordination of initial submittals and other administrative "start-up" activities, submit the schedule of values to the Architect/Engineer at the earliest feasible date, but in no case later than 14 days before initial payment request is to be submitted.
2. FORMAT FOR SCHEDULE OF VALUES: Arrange the schedule with line items to indicate the generic name of item and related specification sections with columns giving the quantity, material value, labor value, total value, percent complete, amount completed to date, amount previously requested and amount of this request. All amounts shall include prorata shares of overhead and profit and other general overhead not included in a line item. Total columnar footings shall equal contract sum. The Schedules of Values shall be in a format similar to the sample form under Conditions of the Contract.
3. DIRECT AND INDIRECT COST ITEMS: Show line items of indirect costs, and margins on actual costs, only to the extent such items will be individually listed in payment requests. In general, each item in the schedule of values and in payment requests shall be established to be complete with its total expenses and proportionate share of the general overhead and profit margin. Except as otherwise indicated, those major cost items that are not directly the cost of actual work-in-place, such as distinct temporary facilities, may be either shown as line items in the schedule of values or may be distributed as general overhead expense, at Contractor's option.

4. CHANGE ORDERS: At the next request for payment following approval of a Change Order or Construction Change Directive, the Schedule of Values shall be changed to reflect such changes in the Contract. Break down the costs of such changes by separate line items as required to allow confirmation of costs in requests for payment.
5. SCHEDULE UPDATING: Update and resubmit schedule of values when change orders affect the listing and when the actual performance of the work involves necessary changes of substance to the values previously listed.

## 1.7 PAYMENT REQUESTS

A. GENERAL: Refer to Article 9 of AIA General Conditions and to modifications and additions in Supplementary Conditions. Except as otherwise indicated, the progress payment cycle is to be regular. Each application must be consistent with previous applications and payments. Certain applications for payment, such as the initial application, the application at substantial completion, and the final payment application involve additional requirements.

1. WAIVER OF LIEN: Each progress payment must be submitted with Contractor's waiver for the period of construction covered by the application. After the first progress payment, each request for payment must be submitted with waivers from the subcontractors or sub-subcontractors and suppliers for the previous period of construction covered by the previous application. The final payment application must be submitted together with or preceded by final or complete waivers from every entity involved with performance of the work covered by the payment request.
2. WAIVER FORMS: Submit waivers on forms, and executed in a manner, acceptable to Owner.

B. PAYMENT APPLICATION TIMES: The "date" for each progress "payment" is as indicated in Owner-Contractor Agreement or, if none is indicated therein, it is the 15th day of each month. The period of construction work covered by each payment request is period indicated in Owner-Contractor Agreement or, if none is indicated therein, it is period ending 15 days prior to date for each progress payment, and starting day following end of preceding period.

C. PAYMENT APPLICATION FORMS: Use forms similar to the sample copy included under Contractual Conditions.

D. APPLICATION PREPARATION: Except as otherwise indicated, complete every entry provided for on the form, including notarization and execution by authorized persons. Incomplete applications will be returned by Architect/Engineer without action. Entries must match current data of schedule of values and progress schedule and report. Listing must include amounts of change orders issued prior to last day of the "period of construction" covered by application.

E. INITIAL PAYMENT APPLICATION: The principal administrative actions and submittals which must precede or coincide with submittal of Contractor's first payment application can be summarized as follows, but not necessarily by way of limitation:

1. Listing of subcontractors and principal suppliers and fabricators.

2. Schedule of values.
3. Progress schedule (preliminary if not final).
4. Schedule of principal products.
5. Schedule of unit prices.
6. Schedule of submittals (when required).
7. Listing of Contractor's staff assignments and principal consultants.
8. Posting of required building permits and similar authorizations and licenses from governing authorities for current performance of the work.

F. APPLICATION AT TIME OF SUBSTANTIAL AND FINAL COMPLETION: Refer to Section 01700 - Project Closeout for requirements prior to submitting substantial completion and final completion requests for payment.

G. APPLICATION TRANSMITTAL: Submit 4 executed copies of each payment application, one copy of which is completed with waivers of lien and similar attachments. Transmit each copy with a transmittal form listing those attachments, and recording appropriate information related to application in a manner acceptable to Architect/Engineer. Transmit to Architect/ Engineer by means ensuring receipt within 24 hours.

END OF SECTION 01310

# SECTION 01340 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section. Refer particularly to Paragraph 3.12, Shop Drawings, Product Data and Samples, of AIA General Conditions.

### 1.2 GENERAL

A. This section specifies procedural requirements for non-administrative submittals including shop drawings, product data, samples and other miscellaneous work-related submittals. Shop drawings, product data, samples and other work-related submittals are required to amplify, expand and coordinate the information contained in the Contract Documents.

1. Refer to other Division-1 sections and other contract documents for specifications on administrative, non-work-related submittals.

### 1.3 COORDINATION

A. Coordinate the preparation and processing of submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities such as testing, purchasing, fabrication, delivery and similar activities that require sequential activity.

1. Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the Architect/Engineer's need to review a related submittal. The Architect/Engineer reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

### 1.4 COORDINATION OF SUBMITTAL TIMES

A. Prepare and transmit each submittal to the Architect/Engineer sufficiently in advance of the scheduled performance of related work and other applicable activities. Transmit different kinds of submittals for the same unit of work so that processing will not be delayed by the Architect/Engineer's need to review submittals concurrently for coordination.

1. It shall also be the responsibility of the Contractor to coordinate the preparation of shop drawings and product data of items which will be furnished by more than one manufacturer but which are designed to interface when installed.

## 1.5 REVIEW TIME

A. It shall be the responsibility of the Contractor to properly schedule the submission of shop drawings and product data for approval to allow adequate time for checking of drawings and the manufacture and shipment of items to the job site in sufficient time to prevent delay in the progress schedule. Advise the Architect/Engineer on each submittal as to whether or not processing time is critical to the progress of the work and if the work would be expedited if processing time could be shortened.

1. The Owner will not grant a time extension based on delays due to the improper scheduling of submittals which might result in a delay in the Work; and the Owner, at his discretion, may withhold progress payments until such time a these requirements are fully satisfied.

## 1.6 SPECIFIC SUBMITTAL REQUIREMENTS

A. Shop drawings and product data shall be submitted for manufactured or fabricated materials as called for in the separate specification sections. Drawings shall be fully identified by project name, location, supplier's name, date, drawing number, specification section reference, etc. The Contractor shall submit, with such promptness as to cause no delay in his work or in that of any other contractor, four copies (in addition to those copies necessary for his own requirements) of all shop drawings, product data and schedules, required for the work of the various trades, to the Architect/ Engineer, for approval. The Contractor shall make no deviation from the approved shop drawings and the changes made thereto by the Architect/Engineer, if any.

B. Submittals shall have the section number and section title on each submittal (see illustration below).

| Section Number | DESCRIPTION |
|---|---|
| 02630 | Storm Drainage |
| 04810 | Unit Masonry Assemblies |
| 03300 | Cast-in-Place Concrete |
| 07550 | Modified Bituminous Membrane Roofing |

## 1.7 REVIEW AND APPROVAL OF SHOP DRAWINGS AND PRODUCT DATA BY CONTRACTOR

A. Each submittal shall have an individual cover sheet **for each copy submitted** showing the section number, along with the section title. Shop drawings and product data submitted to the Architect for his approval shall first be checked and approved by the Contractor, the prima facie evidence of which shall be a **"checked" stamp marked "Approved" or "Approved as Noted" on each copy of each shop drawing or product data, placed thereon by the Contractor.** Shop

drawings and product data received without the Contractor's "checked" stamp will be cause for immediate return without further action.

## 1.8 ARCHITECT/ENGINEER'S ACTION

A. Each drawing or data sheet correctly submitted will be checked by the Architect/Engineer and marked by him in one of the following ways:

1. No exception taken
2. Rejected
3. Make corrections noted
4. Revise and resubmit

## 1.9 SUBMITTAL SCHEDULE

A. If and when required by the Architect/Engineer, the Contractor shall prepare and shall submit, in triplicate, to the Architect/Engineer, a completely itemized schedule of shop drawings, brochures and other descriptive literature, listing each and all such items as required under these specifications, which schedule shall indicate for each required item:

1. Identification as to pertinent division.
2. Item(s) involved.
3. Name of pertinent subcontractor or supplier and name of pertinent manufacturer.
4. Schedule date of delivery of pertinent items to the project.

## 1.10 BROCHURES ON MATERIAL AND EQUIPMENT

A. The subcontractor for all phases of the contract shall submit, through the General Contractor, complete brochures covering all materials and/or equipment proposed for use in the execution of the work, as required by their respective divisions of the specifications. These brochures shall be indexed and properly cross-referenced to plans and specifications for easy identification.

1. All shop drawings, setting drawings, material brochures, samples and/or color selection materials which are required shall be submitted via the General Contractor. Insofar as is possible OR PRACTICAL, all shop drawings or descriptive literature of equipment for the mechanical or electrical trades shall be submitted in a complete brochure for each trade, as soon as possible after Notice to Proceed is executed.

## 1.11 SAMPLES

A. Furnish all samples as required by the contract documents, for the purpose of making color selections or to illustrate materials, equipment or workmanship and to establish standards by which the work will be judged.

## 1.12 COLOR SCHEDULES

A. Not later than 14 calendar days after authorization to proceed with the contract work, submit to the Architect/Engineer the names of all manufacturers and the trade names for all materials involving selections based upon color or texture which are proposed for actual use in the building. Color harmony demands that the schedules not be prepared on a piecemeal basis. The Architect/Engineer will, therefore, require that information on all items be submitted before selections and/or schedules are furnished on any items. If such information is not furnished by the Contractor within the required period, the Architect/Engineer will select colors and textures from the products named in the specifications; and the Contractor will furnish and install the selected products.

1. Where samples are necessary to such selection, furnish same. This requirement applies to all such items as plastic laminate, paint, composition flooring, hard tile and any other items involving color. Color items even in the same range vary among different manufacturers' products; and it is, therefore, important that selections be made from the items actually intended for use in the work.

END OF SECTION 01340

## SECTION 01400 - STANDARDS AND QUALITY CONTROL

### 1.0 - GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

**DESCRIPTION OF REQUIREMENTS**:

**GENERAL**: Required inspection and testing services are intended to assist in the determination of probable compliance of the work with requirements specified or indicated. These required services do not relieve the Contractor of responsibility for compliance with these requirements or for compliance with requirements of the contract documents.

**DEFINITIONS**: The requirements of this section relate primarily to customized fabrication and installation procedures, not to the production of standard products. Quality control services include inspections and tests and related actions including reports, performed by independent agencies and governing authorities, as well as directly by the Contractor. These services do not include Contract enforcement activities performed directly by the Architect or Engineer.

Specific quality control requirements for individual units of work are specified in the sections of these specifications that specify the individual element of the work. These requirements, including inspections and tests, cover both production of standard products, and fabrication of customized work. These requirements also cover quality control of the installation procedures.

Inspections, tests and related actions specified in this section and elsewhere in the contract documents are not intended to limit the Contractor's own quality control procedures which facilitate overall compliance with requirements of the contract documents.

Requirements for the Contractor to provide quality control services as required by the Architect/Engineer, the Owner, governing authorities or other authorized entities are not limited by the provisions of this section.

**STANDARDS SET BY CODES AND REGULATIONS**: The project is to be constructed within the boundaries of Columbia County, Florida and is, therefore, subject to all County ordinances and Codes, which shall be strictly adhered to. Construction shall meet the requirements of the Florida Building Code 2004.

Where codes, standards and publications of public or private bodies are referred to in the Contract Documents, references are intended to be the latest edition or revision prior to the date of receiving bids, except where otherwise indicated.

The design has been based on requirements of the Florida Building Code 2004; and while it is not the responsibility of the Contractor to verify that all work called for complies with this Code, the Contractor shall be responsible for calling to the Architect/Engineer's attention any details or specifications that are not in conformance with this or other Codes. Where no specific method or form of construction is called for in the contract documents, the Contractor shall comply with Code requirements in carrying out such work.

Comply with regulations and Codes of suppliers of utilities; and comply with all other local, State and Federal regulations and standards concerning building construction.

**GENERAL QUALITY AND STANDARDS**: To facilitate rapid examination, the detailed specifications concerning basic requirements for labor, materials, equipment and/or incidentals to be used on the project are included under the various divisions in as brief a form as is consistent with clarity. The primary concern of the detailed specifications is for standards of performance expected for the finished work.

The interests of the Owner, the General Contractor and others concerned with the work require the inclusion of certain general governing requirements and standards, as a precaution against contingency and to provide for the conditions under which the construction and the administration of the work will be carried out.

General requirements for the quality of the work, when not otherwise covered in more specific detail in the specifications, will be governed by certain trade standards as described in this section on "Standards and Quality Control."

The Contractor shall be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. The Architect/Engineer may require the Contractor to produce reasonable evidence that a material meets such requirements. This may be done by providing certified reports of past tests by qualified testing laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of the Architect/Engineer, would lead to a reasonable certainty that any material used, or proposed to be used, in the Work meets the requirements of the Contract Documents. All such data shall be furnished at the Contractor's expense.

These specifications consider the project as a whole and assume its completion under a general contract. Further, the scope of subcontracts and the quantities of materials and labor supplied to the General Contractor by others are assumed to be matters governed by agreement between the General Contractor and his subcontractors and suppliers and not by agreement between the Owner and any subcontractor or supplier.

Various sections of the construction specifications are intended to govern only the quality of work and/or materials incidental to the particular branch of work mentioned in the section title. Sections are not intended as itemizations of the work or materials to be furnished or to limit or define the scope of any subcontract or agreement to furnish material and labor.

The organization of the specifications is for convenience only, and such organization implies no assumption by the Architect/Engineer of the responsibility of arbitrator in establishing subcontract limits or in allotting portions of the work to various subcontractors.

Indications or notations on the drawings which apply to one of a number of similar situations, materials or processes shall be deemed to apply to all such situations, materials or processes wherever they appear in the Work, except where the Contract Documents clearly indicate to the contrary.

The furnishing of all items of material, labor, equipment and/or incidentals necessary to the completion of the project as a whole will be expected when such items are called for on the

drawings by diagram, note or schedule; are listed in the specifications; or are reasonably inferred by either or a combination of both.

**RESPONSIBILITIES FOR TESTING**:

**CONTRACTOR RESPONSIBILITIES**: Except where they are specifically indicated as being the Owner's responsibility, or where they are to be provided by another identified entity, inspections, tests and similar quality control services are the Contractor's responsibility; these services also include those specified to be performed by an independent agency and not directly by the Contractor. Costs for these services shall be included in the Contract Sum. The Contractor shall employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified.

**RETEST RESPONSIBILITY**: Where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance of related work with the requirements of the contract documents, then retests are the responsibility of the Contractor, regardless of whether or not the original test was the Contractor's responsibility. Retesting of work revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original work.

**RESPONSIBILITY FOR ASSOCIATED SERVICES**: The Contractor is required to cooperate with the independent agencies performing required inspections, tests and similar services. Provide such auxiliary services as are reasonably requested. Notify the testing agency sufficiently in advance of operations to permit assignment of personnel. These auxiliary services include but are not necessarily limited to the following:

Providing access to the work.
Taking samples or assistance with taking samples.
Security and protection of samples and test equipment at the project site.

**COORDINATION**: The Contractor and each independent agency engaged to perform inspections, tests and similar services for the project shall coordinate the sequence of their activities so as to accommodate required services with a minimum of delay in the progress of the work. In addition the Contractor and each independent testing agency shall coordinate their work so as to avoid the necessity of removing and replacing work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking of samples and similar activities.

**QUALIFICATION FOR TESTING AND INSPECTIONS**: Except as otherwise indicated, engage inspection and test service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which are recognized in the industry as specialized in the types of inspections and tests to be performed.

**REPORT DATA**: Written reports of each inspection, test or similar service shall include, but not be limited to the following:

Name of testing agency or test laboratory.
Dates and locations of samples and tests or inspections.
Names of individuals making the inspection or test.

Designation of the work and test method.
Complete inspection or test data.
Test results.
Interpretations of test results.
Notation of significant ambient conditions at the time of sample-taking and testing.
Comments or professional opinion as to whether inspected or tested work complies with requirements of the contract documents. Recommendations on retesting, if applicable.

**TESTING**: The Architect/Engineer shall designate the tests which shall be made, and the Contractor shall not obligate the Owner for tests without the Architect/Engineer's approval.

**A. TESTING COSTS PAID FOR BY THE CONTRACTOR**: Certain tests of materials, equipment and systems are required as part of the contract and shall be paid for by the Contractor. These are specifically named in the technical specifications, and the types of tests are as follows:

(1) Where tests are required by the technical specifications for materials, methods or equipment, the Contractor shall pay the cost of INITIAL tests to prove qualities and determine conformance with specification requirements, e.g., mill tests on cement and steel; load testing of piling; sieve analysis and colorimetric tests on sand; strength test for determining proportions of materials for concrete; moisture content and sound transmission tests of concrete blocks; design mix for asphaltic concrete; etc.

(2) If substitute materials or equipment are proposed by the Contractor, he shall pay the cost of ALL TESTS which may be necessary to satisfy the Architect/Engineer that specification requirements are met.

(3) If materials or workmanship are used which fail to meet specification requirements, the Contractor shall pay the cost of all coring or other tests deemed necessary by the Architect/Engineer to determine the safety or suitability of the material or element.

(4) The Contractor shall pay for all testing costs, including, but not limited to, power, fuel and equipment cost, which may be required for complete testing of all equipment and systems for proper operation, such as plumbing and electrical.

(5) The Contractor shall arrange and pay for tests to confirm compliance of materials and procedures with initial tests and specifications. Examples of such tests include compressive tests of concrete and concrete block, Proctor and compaction tests of fill material and earthwork. Detailed requirements for such tests are outlined under the section of the specifications pertaining to that phase of the work.

**B. TESTING COSTS BORNE BY THE OWNER**: Other tests shall be paid for by the Owner and not as part of the contract. These are as follows:

Additional tests for specified materials, methods or equipment after initial tests and acceptance of the product or method, provided the supplier and the quality of the products are not changed. In such case, initial tests shall be required.

Examples: compressive tests of concrete and concrete block; services of testing laboratories for control of concrete; Proctor and compaction tests of fill material; or

other special testing or inspection after initial tests and acceptance of the product or method.

**2.0 - PRODUCTS** (Not Applicable).

**3.0 - EXECUTION**

**REPAIR AND PROTECTION**:

**GENERAL**: Upon completion of inspection, testing, sample-taking and similar services performed on the work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Comply with the contract document requirements. Protect work exposed by or for quality control service activities, and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01400

## SECTION 01500 - TEMPORARY FACILITIES

### 1.0 - GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to the work of this section.

**DESCRIPTION OF REQUIREMENTS**: This section specifies administrative and procedural requirements for temporary services and facilities, including such items as temporary utility services, temporary construction and support facilities, and project security and protection.

**USE CHARGES**: No cost or usage charges for temporary services or facilities are chargeable to the Owner or Architect/Engineer. Cost or use charges for temporary services or facilities will not be accepted as a basis of claims for a change-order extra.

Impact fees and front foot charges for sewer and water connections are not to be included under this contract.

**TEMPORARY UTILITY SERVICES**: Required for use at the project site include but are not limited to the following:

Water service and distribution.
Temporary electric power and light.
Telephone service.
Storm and sanitary sewer.

Provide adequate utility capacity at each stage of construction. Prior to availability of temporary utilities at the site, provide trucked-in services for start-up of construction operations.

Obtain and pay for temporary easements required to bring temporary utilities to the project site, where the Owner's permanent easement cannot be utilized for that purpose.

**TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES**: Required for the project include but are not limited to the following:

Temporary heat.
Field offices and storage sheds.
Temporary roads and paving.
Sanitary facilities, including drinking water.
Dewatering facilities and drains.
Temporary enclosures.

Hoists and temporary elevator use.
First aid station.
Project identification, bulletin boards and signs.
Waste disposal services.
Rodent and pest control.
Construction aids and miscellaneous general services and facilities.

Alternate temporary services and facilities, equivalent to those specified, may be used, subject to acceptance by the Architect/Engineer.

**SECURITY AND PROTECTION FACILITIES AND SERVICES**: Required for the project include but are not limited to the following:

Temporary fire protection.
Barricades, warning signs, lights.
Sidewalk bridge or enclosure fence for the site.
Environmental protection.

Alternate security and protection methods or facilities, equivalent to those specified, may be used, subject to acceptance by the Architect/Engineer.

**QUALITY ASSURANCE**:

**REGULATIONS**: Comply with requirements of local laws and regulations governing construction and local industry standards, in the installation and maintenance of temporary services and facilities, including but not limited to the following:

Building Codes, including local requirements for permits, testing and inspection.
Health and safety regulations.
Utility company regulations and recommendations governing temporary utility services.
Police and Fire Department rules and recommendations.
Environmental protection regulations governing use of water and energy, and the control of dust, noise and other nuisances.

In addition, comply with "Environmental Impact" commitments the Owner or previous Owners of the site may have made to secure approval to proceed with construction of the project.

**STANDARDS**: Comply with the requirements of NFPA Code 241, "Building Construction and Demolition Operations", the ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and the NECA National Joint Guideline NJG-6 "Temporary Job Utilities and Services".

**INSPECTIONS**: Inspect and test each service before placing temporary utilities in use. Arrange for required inspections and tests by governing authorities, and obtain required certifications and permits for use.

**JOB CONDITIONS**:

**GENERAL**: Provide each temporary service and facility ready for use at each location when the service or facility is first needed to avoid delay in performance of the work. Maintain, expand as required and modify temporary services and facilities as needed throughout the progress of the Work. Do not remove until services or facilities are no longer needed, or are replaced by the authorized use of completed permanent facilities.

With the establishment of the job progress schedule, establish a schedule for the implementation and termination of service for each temporary utility. At the earliest feasible

time, and when acceptable to the Owner and Architect/Engineer, change over from the use of temporary utility service to the use of the permanent service, to enable removal of the temporary utility and to eliminate possible interference with completion of the work. Contractor will be responsible for all utility costs until final acceptance or occupancy, whichever comes earliest.

**CONDITIONS OF USE**: Operate temporary services and facilities in a safe and efficient manner. Do not overload temporary services or facilities, and do not permit their interference with the progress of the work. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.

**TEMPORARY UTILITIES**: Do not permit the freezing of pipes, flooding or the contamination of water sources.

**TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES**: Maintain temporary facilities in a manner to prevent discomfort to users. Take necessary fire prevention measures. Maintain temporary support facilities in a sanitary manner to avoid health problems and other deleterious effects.

**SECURITY AND PROTECTION**: Maintain site security and protection facilities in a safe, lawful and publicly acceptable manner. Take necessary measures to prevent erosion of the site.

## 2.0 - PRODUCTS

**MATERIALS AND EQUIPMENT**:

**GENERAL**: Provide new materials and equipment for temporary services and facilities; used materials and equipment that are undamaged and in serviceable condition may be used, if acceptable to the Architect/Engineer. Provide only materials and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards.

**TEMPORARY UTILITIES**: Where the local utility company provides only a portion of the temporary utility, provide the remainder with matching, compatible materials and equipment. Comply with the utility company's recommendations.

**ELECTRICAL SERVICE**: Comply with applicable NEMA, NECA and UL standards and governing regulations for materials and layout of temporary electric service, including those requirements included in Division-16 sections.

**VOLTAGE DIFFERENCES**: Provide identification warning signs at power outlets which are other than 110-120 volt power. Provide polarized outlets for plug-in type outlets, to prevent insertion of 110-120 volt plugs into higher voltage outlets.

**GROUND-FAULT PROTECTION**: Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for plug-in connection of power tools and equipment.

**ELECTRICAL POWER CORDS**: Use only grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Use single lengths or use

waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas of work.

**LAMPS AND LIGHT FIXTURES**: Provide general service incandescent lamps of wattage indicated or required for adequate illumination. Protect lamps with guard cages or tempered glass enclosures, where fixtures are exposed to breakage by construction operations. Provide exterior fixtures where fixtures are exposed to the weather or moisture.

**TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES**: Provide facilities that can be maintained properly throughout their use at the project site.

**TEMPORARY OFFICES AND SIMILAR CONSTRUCTION**: For temporary offices, fabrication shops, storage sheds and similar construction, provide either standard prefabricated or mobile units or the equivalent job-built construction. Provide insulated, weather tight units, heated or air-conditioned where indicated, lockable entrances, operable windows, roofing, foundations adequate for normal loading, including wind loads, serviceable finishes, and mechanical and electrical equipment necessary to achieve ambient conditions indicated.

**SELF-CONTAINED TOILET UNITS**: Provide single-occupant self-contained toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar non-absorbent material.

**FIRST AID SUPPLIES**: Comply with governing regulations and recognized recommendations within the construction industry.

**DRINKING WATER**: Provide potable water approved by local health authorities. Where well water must be used, comply with local health authorities recommendations for type and frequency of testing water for potability.

**SIGN MATERIALS**: For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thicknesses indicated. Provide exterior grade acrylic-latex-base enamel for painting panels and applying graphics.

**SECURITY AND PROTECTION FACILITIES**:

**FIRE EXTINGUISHERS**: Provide type "A" fire extinguishers for temporary offices and similar spaces where there is minimal danger of electrical or grease-oil-flammable liquid fires. In other locations provide type "ABC" dry chemical extinguishers, or a combination of several extinguishers of NFPA recommended types for the exposures in each case.

**PLYWOOD**: For fences and vision barriers, provide exterior type, minimum 3/8" thick plywood, prime and finish painted. For safety barriers, sidewalk bridges and similar direct-contact uses, provide minimum 5/8" thick exterior plywood, prime and finish painted.

**OPEN-MESH FENCING**: Provide No. 11-gage galvanized chain link fabric fencing 6 feet high with galvanized barbed wire top strand and galvanized steel pipe posts, 1-1/2" I.D. for line posts, and 2-1/2" I.D. for corner posts.

**WIRE FENCING**: Provide 4-ft. high woven wire fence or welded wire mesh fencing supported by 6-ft. long, 4-in. round or square wood posts set 2 feet in ground and spaced not greater than 12 feet o.c.

## 3.0 - EXECUTION

### INSTALLATION, GENERAL:

**GENERAL**: Use qualified tradesmen for installation of temporary services and facilities. Locate temporary services and facilities where they will serve the entire project adequately and result in minimum interference with the performance of the Work.

Relocate, modify and extend services and facilities as required during the course of work to accommodate the entire work of the project.

### TEMPORARY UTILITY INSTALLATION:

**GENERAL**: Engage the local utility company to install temporary service to the project, or to make connections to existing service. Arrange with the companies and existing users for an acceptable time when service can be interrupted, where necessary, to make connections for temporary services.

### WATER SERVICE:

**GENERAL**: Install water service and distribution piping of sizes and pressures adequate for construction purposes during the construction period and until permanent service is in use.

Obtain water service from the nearby water main of the local water authority, as permitted by the governing authority. Pay water service use charges, whether metered or otherwise, for all water used by entities authorized to be at or to perform work at the project site. Exercise control over usage in an effort to conserve water.

### TEMPORARY ELECTRIC POWER SERVICE:

**GENERAL**: Provide a weatherproof, grounded temporary electric power service and distribution system of sufficient size, capacity, and power characteristics to accommodate performance of work during the construction period. Whenever an overhead floor or roof deck has been installed, install temporary lighting adequate to provide sufficient illumination for safe work and traffic conditions in every area of work.

**TEMPORARY SERVICE**: Install service and grounding in compliance with the National Electric Code (NFPA 70). Include necessary meters, transformers, overload protected disconnect and main distribution switch gear.

Connect temporary service to the local electric power company main in the manner directed by company officials. Pay use charges, whether metered or otherwise, for electricity used by all entities authorized to be at or to perform the work at the project site. Exercise control over power usage in an effort to conserve energy.

**POWER DISTRIBUTION SYSTEM**: Provide circuits of adequate size and proper characteristics for each use. In general run wiring overhead, and rise vertically where wiring will be least exposed to damage from construction operations. Provide rigid steel conduit or equivalent raceways for wiring which must be exposed on grade, floors, decks or other areas of possible damage or abuse.

**TEMPORARY LIGHTING**:

Provide local switching of temporary lighting, spaced to allow lighting to be turned off in patterns to conserve energy and retain light suitable for work-in-progress, access traffic, security check and project lock-up.

Install and operate temporary lighting that will provide adequate illumination for general construction and fulfill security and protection requirements, without the necessity of operating the entire temporary lighting system.

**TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION**:

**GENERAL**: Provide a reasonably neat and uniform appearance in temporary construction and support facilities acceptable to the Architect/Engineer and the Owner.

Locate field offices, storage and fabrication sheds and other support facilities for easy access to the Work. Position offices so that windows give the best possible view of construction activities.

Except as otherwise indicated, make the change-over from use of temporary services and facilities to use of permanent services and facilities at the earliest feasible date at each portion of the building, to minimize hazards and interferences with performance of the Work.

Maintain field offices, storage and fabrication sheds, temporary sanitary facilities, waste collection and disposal systems, and project identification and temporary signs until near substantial completion. Immediately prior to substantial completion remove these facilities. Personnel remaining at the site beyond substantial completion will be permitted to use certain permanent facilities, under restricted use conditions acceptable to the Owner.

**TEMPORARY HEAT**:

**GENERAL**: Provide temporary heat where indicated or needed for performance of the Work, curing or drying of recently installed work or protection of work in place from adverse effects of low temperatures or high humidity. Select facilities known to be safe and without deleterious effect upon the work in place or being installed. Coordinate with ventilation requirements to produce the indicated ambient condition required and to minimize the consumption of fuel or energy.

**FIELD OFFICES**:

**CONTRACTOR'S FIELD OFFICE AND STORAGE SHEDS**: The Contractor shall construct or provide a field office and temporary storage sheds as required for his needs. The construction shall be of adequate structural design not to constitute a safety hazard and shall comply with all local ordinances and regulations. The structures are to be neat in appearance

and so maintained during the entire construction time. This requirement applies to all temporary facilities constructed by subcontractors. Erect sheds or enclosed protection to properly protect any materials stored on the site.

**DEWATERING AND TEMPORARY DRAINAGE**: Provide dewatering and/or drainage, to prevent surface water and subsurface or ground water from flooding into excavations and to prevent water from flooding the project site and the surrounding area. Do not allow water to accumulate in excavations. Remove water from excavations, using dewatering methods which will prevent the softening of foundation bottoms, undercutting footings and soil changes detrimental to the stability of subgrades and foundations. Provide and maintain pumps, sumps, suction and discharge lines and other dewatering system components necessary to convey water away from excavations. Divert surface water from excavations; and maintain ground water at least 1'-6" below bottoms of excavations until foundations, waterproofing and basement floor slabs and walls are in place and cured. Boring logs, on file in the Architect/ Engineer's office, indicate the elevation of ground water at the time of the borings, but seasonal variations must be anticipated. Comply with all pollution control regulations.

END OF SECTION 01500

# SECTION 01631 - PRODUCTS AND SUBSTITUTIONS

## 1.0 - GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

**DESCRIPTION OF REQUIREMENTS**:

**DEFINITIONS**:

"Products" are items purchased for incorporation in the Work, regardless of whether they were specifically purchased for the project or taken from the Contractor's previously purchased stock. The term "product" as used herein includes the terms "material", "equipment", "system" and other terms of similar intent.

"Named Products" are products identified by use of the manufacturer's name for a product, including such items as a make or model designation, as recorded in published product literature, of the latest issue as of the date of the contract documents.

"Materials" are products that must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form units of work.

"Equipment" is defined as a product with operational parts, regardless of whether motorized or manually operated, and in particular, a product that requires service connections such as wiring or piping.

**QUALITY ASSURANCE**:

**SOURCE LIMITATIONS**: To the fullest extent possible, provide products of the same generic kind, from a single source, for each unit of work.

**COMPATIBILITY OF OPTIONS**: Compatibility of products is a basic requirement of product selection. When the Contractor is given the option of selecting between two or more products for use on the project, the product selected must be compatible with other products previously selected, even if the products previously selected were also Contractor options. The complete compatibility between the various choices available to the Contractor is not assured by the various requirements of the Contract documents, but must be provided by the Contractor.

## 2.0 - PRODUCTS

**GENERAL PRODUCT COMPLIANCE**:

**GENERAL**: Requirements for individual products are indicated in the contract documents; compliance with these requirements is in itself a contract requirement. These requirements may be specified in any one of several different specifying methods, or in any combination of these methods. These methods include the following:

Proprietary.
Descriptive.
Performance.
Compliance with Reference Standards.

Compliance with codes, compliance with graphic details, allowances, and similar provisions of the contract documents also have a bearing on the selection process.

Provide products that comply with the requirements of the contract documents and that are undamaged and, unless otherwise indicated, unused at the time of installation. Provide products that are complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

**STANDARD PRODUCTS**: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

**CONTINUED AVAILABILITY**: Where, because of the nature of its application, the Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard, domestically produced products for which the manufacturer has published assurances that the products and its parts are likely to be available to the Owner at a later date.

**PROCEDURES FOR SELECTING PRODUCTS**: The Contractor's options in selecting products are limited by requirements of the contract documents and governing regulations. His options are not controlled by industry traditions or procedures experienced by the Contractor on previous construction projects. Required procedures include but are not limited to the following for the various indicated methods of specifying:

**PROPRIETARY AND SEMI-PROPRIETARY SPECIFICATION REQUIREMENTS**:

**SINGLE PRODUCT NAME**: Where only a single product or manufacturer is named, provide the product indicated, unless the specification indicates possible consideration of other products. Advise the Architect/Engineer before proceeding, when discovered that the named product is not a reasonable or a feasible solution.

**TWO OR MORE PRODUCT NAMES**: Where two or more products or manufacturers are named, provide one of the products named, at the Contractor's option. Exclude products that do not comply with specification requirements. Do not provide or offer to provide an unnamed product, unless the specification indicates possible consideration of other products. Advise the Architect/Engineer before proceeding where none of the named products comply with specification requirements, or are feasible for use.

Where products or manufacturers are specified by name, accompanied by the term "or-equal" or similar language, comply with the contract document provisions concerning "substitutions" to obtain approval from the Architect/Engineer for the use of an unnamed product.

**DESCRIPTIVE SPECIFICATION REQUIREMENTS**: Where the specifications describe a product or assembly generically, in detail, listing the exact characteristics required, but

without use of a brand or trade name, provide products or assemblies that provide the characteristics indicated and otherwise comply with contract requirements.

**PERFORMANCE SPECIFICATION REQUIREMENTS**: Where the specifications require compliance with indicated performance requirements, provide products that comply with the specific performance requirements indicated, and that are recommended by the manufacturer for the application indicated. The manufacturer's recommendations may be contained in published product literature, or by the manufacturer's individual certification of performance. General overall performance of a product is implied where the product is specified for specific performances.

**COMPLIANCE WITH STANDARDS, CODES AND REGULATIONS**: Where the specifications require only compliance with an imposed standard, code or regulation, the Contractor has the option of selecting a product that complies with specification requirements, including the standards, codes and regulations.

**VISUAL MATCHING**: Where matching an established sample is required, the final judgment of whether a product proposed by the Contractor matches the sample satisfactorily will be determined by the Architect/Engineer. Where there is no product available within the specified product category that matches the sample satisfactorily and also complies with other specified requirements, comply with the provisions of the contract documents concerning "substitutions" and "change orders" for the selection of a matching product in another product category, or for non-compliance with specified requirements.

**VISUAL SELECTION**: Except as otherwise indicated, where specified product requirements include the phrase "...as selected from the manufacturer's standard colors, patterns, textures..." or similar phrases, the Contractor has the option of selecting the product and manufacturer, provided the selection complies with other specified requirements. The Architect/Engineer is subsequently responsible for selecting the color, pattern and texture from the product line selected by the Contractor.

**ALLOWANCES**: Refer to individual sections of the specifications and "Allowance" provisions in Division-1 sections for an indication of product selections that are controlled by established allowances, and for the procedures required for processing such selections.

**PRODUCER'S STATEMENT OF APPLICABILITY**: Where individual specification sections indicate products that require a "Statement of Applicability" from the manufacturer or other producer, submit a written-certified statement from the producer stating that the producer has reviewed the proposed application of the product on the project. This statement shall state that the producer agrees with or does not object to the Architect/Engineer's specification and the Contractor's selection of the product for use in the Work. The statement shall also state that the proposed application of the product on the project is suitable and proper.

**SUBSTITUTIONS**: The Contractor's requests for changes in the products, materials, equipment and methods of construction required by the contract documents are considered requests for "substitutions", and are subject to the requirements specified herein. The following are not considered as substitutions:

Revisions to the contract documents, where requested by the Owner, Architect or Engineer are considered as "changes" not substitutions.

Substitutions requested during the bidding period, which have been accepted prior to the Contract Date, are included in the contract documents and are not subject to the requirements for substitutions as herein specified.

Specified Contractor options on products and construction methods included in the contract documents are choices available to the Contractor and are not subject to the requirements for substitutions as herein specified.

Except as otherwise provided in the contract documents, the Contractor's determination of and compliance with governing regulations and orders as issued by governing authorities do not constitute "substitutions" and do not constitute a basis for change orders.

Substitutions will not be considered if:

A. they are indicated or implied on shop drawing submissions without the formal request required herein (the Contractor's submittal of and the Architect/Engineer's acceptance of shop drawings, product data or samples which relate to work not complying with requirements of the contract documents, does not constitute an acceptable or valid request for a substitution, nor approval thereof); or

B. for their implementation they require a substantial revision of the contract documents in order to accommodate their use.

**REPRESENTATION OF CONTRACTOR**: Requests for substitutions based on the conditions, described herein, when forwarded by the Contractor to the Architect/Engineer, are understood to mean that the Contractor:

(1) has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;

(2) will provide the same warranty for the substitution that he would for that specified;

(3) certifies that the cost data presented is complete and includes all related costs under this contract but excludes costs under separate contracts and the Architect/Engineer's re-design costs and that he waives all claims for additional costs related to the substitution which subsequently become apparent; and

(4) will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.

**OTHER RESPONSIBILITIES OF CONTRACTOR FOR SUBSTITUTIONS**:

(1) To accommodate a coordinated design of color, finishes, texture and pattern, the Contractor shall, if required by the Architect/Engineer, furnish the substituted material in a color, finish, texture or pattern which would have been available from the manufacturer originally specified, at no additional cost to the Owner.

(2) Notwithstanding approval or acceptance of a substitution by the Owner or Architect/ Engineer, any additional cost, or any loss or damage arising from the substitution of a

material or method requested by the Contractor for those originally specified, shall be borne by the Contractor.

**REQUIRED PROCEDURE**: After the contract has been executed, the Owner and the Architect/Engineer will consider a formal request for the substitution of products in place of those specified, provided the request:

(a) is submitted within 30 days after the award of the contract;

(b) is accompanied by complete data on the proposed substitution substantiating compliance with the contract documents, including product identification and description, performance and test data, references and samples where applicable and an itemized comparison of the proposed substitution with the products specified or named by Addenda, with data relating to contract time schedule, design and artistic effect where applicable and its relationship to separate contracts, all of which shall be furnished at the Contractor's expense;

(c) is accompanied by accurate cost data on the proposed substitution in comparison with the product specified, whether or not modification to the contract sum is to be a consideration.

(d) includes information pointing out any deviations of the proposed substitute from the requirements of the contract documents;

(e) has complete coordination information, including all changes required in other elements of the work to accommodate the substitution, including work performed by the Owner and separate Contractors;

(f) includes a statement indicating the effect the substitution will have on the work schedule in comparison to the schedule without approval of the proposed substitution and the effect of the proposed substitution on the Contract Time;

(g) includes a certification by the Contractor to the effect that, in the Contractor's opinion, after thorough evaluation, the proposed substitution will result in work that in every significant respect is equal-to or better than the work required by the Contract documents, and that it will perform adequately in the application indicated, (include in this certification, the Contractor's waiver of rights to additional payment or time, which may subsequently be necessary because of the failure of the substitution to perform adequately).

**ARCHITECT/ENGINEER'S ACTION**: Within one week of receipt of the Contractor's request for substitution, the Architect/Engineer will request additional information or documentation as may be needed for evaluation of the request. Within 2 weeks of receipt of the request, or within one week of receipt of the requested additional information or documentation, which ever is later, the Architect/Engineer will notify the Contractor of either the acceptance or rejection of the proposed substitution.

Acceptance will be in the form of a change order.

Rejection will include a statement giving reasons for the rejection.

## 3.0 - EXECUTION

**PRODUCT DELIVERY, STORAGE, AND HANDLING:**

**GENERAL:** Deliver, store, and handle products in accordance with manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft. Control delivery schedules to minimize long-term storage at the site and to prevent overcrowding of construction spaces. In particular coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss.

Deliver products to the site in the manufacturer's sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.

Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.

Store heavy materials away from the project structure in a manner that will not endanger the supporting construction.

**INSTALLATION OF PRODUCTS:**

**GENERAL:** Except as otherwise indicated in individual sections of these specifications, comply with the manufacturer's instructions and recommendations for installation of the products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at time of acceptance.

END OF SECTION 01631

## SECTION 01700 - PROJECT CLOSEOUT

### 1.0 - GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

**DESCRIPTION OF REQUIREMENTS**:

**DEFINITIONS**: Project closeout is the term used to describe certain collective project requirements, indicating completion of the Work that are to be fulfilled near the end of the Contract time in preparation for final acceptance and occupancy of the Work by the Owner, as well as final payment to the Contractor and the normal termination of the Contract.

Specific requirements for individual units of work are included in the appropriate sections in Divisions 2 through 16.

Time of closeout is directly related to "Substantial Completion"; therefore, the time of closeout may be either a single time period for the entire Work or a series of time periods for individual elements of the Work that have been certified as substantially complete at different dates. This time variation, if any, shall be applicable to the other provisions of this section.

**PREREQUISITES TO SUBSTANTIAL COMPLETION**:

**GENERAL**: Complete the following before requesting the Architect/Engineer's inspection for certification of substantial completion, either for the entire Work or for portions of the Work. List known exceptions in the request.

**CLEAN-UP**: As each phase of the work is completed, and prior to the Architect/Engineer's semi-final inspection, the following cleaning shall be done:

a. Completely clean the entire area of dust.
b. Clean or replace filters as required.
c. Remove any paint spots.
d. Clean and polish finish metal.
e. Maintain glass in a reasonably clean condition during construction, to prevent its damage by corrosive action and contribution (by wash-off) to deterioration of glazing materials and other surfaces. Wash and polish glass on both faces, not more than four days prior to the Owner's acceptance of the work in each area. Comply with the glass manufacturer's recommendations.
f. Dust-clean lighting fixtures and mechanical and communications equipment.
g. Clean and polish all finished floors; and seal concrete floors that are to remain exposed. Vacuum all carpeted floors and bases, and protect from potential soilage during final close-out.
h. Clean and polish finish hardware.
i. Dust-clean the insides of cabinets, closets, casework and drawers.
j. Thoroughly clean all plumbing fixtures.
k. Remove handprints from any surfaces.

l. Clean roof areas, flashing, counterflashing and roof accessories; and leave in a neat appearance.
m. Clean all exterior concrete and masonry work of cement and mortar stains or other unsightly blemishes; and waterproof as required.

In the progress payment request that coincides with, or is the first request following, the date substantial completion is claimed, show either 100% completion for the portion of the Work claimed as "substantially complete", or list incomplete items, the value of incomplete work, and reasons for the Work being incomplete.

Include supporting documentation for completion as indicated in these contract documents.

Submit a statement showing an accounting of changes to the Contract Sum.

Advise Owner of pending insurance change-over requirements.

**CONTRACTOR'S SEMI-FINAL INSPECTION**: When work is substantially complete, as defined by AIA General Conditions, make an inspection of the entire work and, with the assistance of all subcontractors, make a detailed list of all items still to be completed. (See Article 9, Paragraph 9.8, of AIA General Conditions.) Then request payment for substantially completed work as provided for under the paragraph pertaining to payments in AIA General Conditions and in Supplementary Conditions. Along with this request, submit to the Architect/ Engineer three copies of the list of items to be completed.

**ARCHITECT/ENGINEER'S SEMI-FINAL PUNCH LIST**: Upon receipt of the above request and information from the General Contractor, the Architect/Engineer will make a detailed semi-final inspection of the work. If the Architect/Engineer finds the work to be substantially complete, he will prepare a Certificate of Substantial Completion for payment by the Owner and will attach thereto the punch list of items to be completed or corrected. This list may not be exhaustive, and failure to include an item on it does not alter the responsibility of the Contractor to complete all work in accord with the contract documents, including authorized changes thereto. If the Architect/Engineer does not concur in the Contractor's claim of substantial completion, he will so notify the Contractor and will state his reasons for his decision. The Contractor shall thereafter take steps to correct the deficiencies and to bring the work to substantial completion, after which the above process will be repeated.

**PREREQUISITES TO FINAL ACCEPTANCE**:

**GENERAL**: Complete the following before requesting the Architect/Engineer's final inspection for certification of final acceptance, and final payment as required by the General Conditions. List known exceptions, if any, in the request.

Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

Submit an updated final statement, accounting for final additional changes to the Contract Sum.

Submit a certified copy of the Architect/Engineer's final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by the Architect/Engineer.

Submit final meter readings for utilities, a measured record of stored fuel, and similar data either as of the date of substantial completion, or else when the Owner took possession of and responsibility for corresponding elements of the Work.

Submit a final liquidated damages settlement statement, acceptable to the Owner.

Submit evidence of final, continuing insurance coverage complying with insurance requirements.

Submit evidence that fire alarm and security systems, if any, have been tested by manufacturer's representative.

Submit certificate for use for elevators, if any, certified by State elevator inspector.

**KEYS AND SPECIAL WRENCHES**: Tag all keys and special wrenches with the room number or the designated use. In the event the keys have been turned over directly to a representative of the Owner, furnish a signed receipt from such representative.

**WARRANTIES**: Prior to final acceptance, furnish written warranties, in duplicate, signed by the subcontractor and the General Contractor where special warranties are called for in the technical sections of specifications. The general warranty on all work is called for in Paragraph 3.5 of General Conditions. Warranties required by the Contract Documents shall begin on the date of Substantial Completion as provided for in Subparagraph 9.8.2 of the AIA General Conditions unless otherwise provided for in the Certificate of Substantial Completion.

**RELEASES OF LIEN**: Furnish affidavits and Releases of Lien in accord with Subparagraph 9.10.2 of AIA General Conditions.

**REINSPECTION PROCEDURE**: The Architect/Engineer will reinspect the Work upon receipt of the Contractor's notice that the work, including punch-list items resulting from earlier inspections, has been completed, except for those items whose completion has been delayed because of circumstances that are acceptable to the Architect/Engineer.

Upon completion of reinspection, the Architect/Engineer will either prepare a certificate of final acceptance, or will advise the Contractor of work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance.

If necessary, the reinspection procedure will be repeated.

**RECORD DOCUMENT SUBMITTALS**:

**GENERAL**: Specific requirements for record documents are indicated in the individual sections of these specifications. Other requirements are indicated in the General Conditions. General submittal requirements are indicated in the various sections of the specifications, including the section on "Shop Drawings, Product Data and Samples".

Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect/Engineer's reference during normal working hours.

**RECORD DRAWINGS**: Maintain a record set of blue or black line white-prints of contract drawings and shop drawings in a clean, undamaged condition. Mark-up the set of record documents to show the actual installation where the installed work varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing the actual "field" condition fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at the corresponding location on the working drawings. Give particular attention to concealed work that would be difficult to measure and record at a later date.

Mark record sets with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work.

Mark-up new information which is known to be important to the Owner, but for some reason was not shown on either contract drawings or shop drawings. Record the exact locations, as installed, of all underground and otherwise concealed conduit, pipe and equipment which were not installed exactly as shown on the contract drawings. Pipe lines and conduit which are installed in furred spaces, pipe chases or other spaces, which can be readily inspected by the use of access panels or other means of access, will not be considered as being concealed. With reference to electrical work, the exact runs of concealed conduit shall be shown on these drawings.

Upon completion of the work, this data shall be recorded to scale by a competent draftsman, on sepia line prints on transparent paper of the contract drawings. Sepias or computer drawings will be furnished to the Contractor by the Architect/Engineer, BUT THE COST SHALL BE BORNE BY THE CONTRACTOR. Where changes are to be recorded, the sepia line prints shall be erased (or the computer drawings edited) before the changes are made. Where the work was installed exactly as shown on the contract drawings, the sepia line prints (or computer drawings) shall not be disturbed other than by being marked "Record Drawings". In showing the changes, the same legend shall be used to identify piping, etc. as was used on the contract drawings. A separate set of drawings shall be prepared for the mechanical and electrical work, unless two or more divisions are shown on the same sheets of the contract drawings, in which case the various subcontractors shall also show their changes on the same sheets. Each sheet shall bear the date and name of the subcontractor submitting the drawings.

The Contractor shall review the completed record drawings and shall ascertain that all data furnished on the sepia drawings are accurate and truly represent the work as actually installed. When manholes, boxes, underground conduits, plumbing, inverts, etc. are involved as part of the work, the Contractor shall furnish true elevations and locations, all properly referenced, by using the original benchmark used for the institution or for this

project. The sepia line prints, including those unchanged and changed, shall be submitted to the Architect/Engineer when completed, together with two sets of blue line or black line prints, for certification and forwarding to the Owner at the time of substantial completion.

Note related change-order numbers where applicable.

Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set. The responsible party for the information provided shall sign each sheet.

**MAINTENANCE AND OPERATING MANUALS**: The General Contractor shall be responsible for collecting, identifying, indexing and collating the following materials from the subcontractors and will deliver three copies of the finished document to the Architect/ Engineer for checking of correctness:

(1) Complete equipment diagrams, operating instructions, maintenance manuals, parts lists, wiring diagrams, pneumatic and/or electrical control diagrams, test and balance reports, inspection reports, guarantees and warranties, as applicable, for each and every piece of fixed equipment furnished under this contract, to be supplied in a ring binder, hard-cover book, properly indexed for ready reference.

(2) Specific information regarding manufacturers' names and addresses; nearest distributors' and service representatives' names, addresses, office and home phone numbers; make and model numbers; operating design and characteristics; etc.

(3) Provide any additional data as called for in the detailed technical specifications.

All information submitted shall be updated to reflect existing conditions.

**GENERAL OPERATING AND MAINTENANCE INSTRUCTIONS**: Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Owner's personnel to provide necessary basic instruction in the proper operation and maintenance of the entire Work. Where installers are not experienced in the required procedures, include instruction by the manufacturer's representatives. This instruction will include normal start-up, run, stop and emergency operations, location and operation of all controls, alarms and alarm systems, etc. The instruction will include tracing the system in the field and on the diagrams in the instruction booklets, so that operating personnel will be thoroughly familiar with both the system and the data supplied.

**FINAL CLEANING**:

**GENERAL**: Special cleaning requirements for specific units of Work are included in the appropriate sections of Divisions 2 through 16. General Cleaning during the regular progress of the Work is required by the General Conditions and is included under section "Temporary Facilities".

**CLEANING**: Provide final cleaning of the Work just prior to final acceptance or occupancy. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a normal, commercial building cleaning and maintenance program. Comply with the manufacturer's instructions for operations. See listing

of clean-up requirements as pre-requisites to substantial completion. After the work is occupied by the Owner, the Contractor is not responsible to do further cleaning.

**REMOVAL OF PROTECTION**: Except as otherwise indicated or requested by the Architect/ Engineer, remove temporary protection devices and facilities which were installed during the course of the work to protect previously completed work during the remainder of the construction period.

**COMPLIANCE**: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at the site. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile or other harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

Where extra materials of value remaining after completion of associated work have become the Owner's property, dispose of these materials to the Owner's best advantage as directed.

**FINAL PAYMENT**: Upon receipt of the above-listed documents and information, the Architect/Engineer will make a final inspection of the project. If all punch list items are complete or corrected, the Architect/Engineer will issue a final certificate to the Owner, recommending that final payment be made. The final payment will be withheld, however, until after the final inspection and approval by the Owner.

END OF SECTION 01700

# SECTION 02110 - SITE PREPARATION AND LAYOUT

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following work:

1. Preparation for beginning construction.
2. Layout of building.

### 1.3 EXAMINATION OF SITE

A. Examine the site and compare conditions with those called for on the drawings and in the specifications, to determine all site conditions which might have a bearing upon the work to be done or the conditions under which work must be done. Failure on the part of the contractor to so inform himself, prior to the submission of a bid, will not relieve him of the responsibility of completing the work in full accord with the requirements of the drawings and these specifications.

### 1.4 PROJECT CONDITIONS

A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct roads, streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.

1. Protect improvements on rights of way, on adjoining properties and on Owner's property.
2. Restore damaged improvements to their original condition, as acceptable to property owners.

## PART 2 - PRODUCTS

Not Used

## PART 3 - EXECUTION

### 3.1 PREPARATION AND LAYOUT

A. Prior to beginning the layout of the building and paving, obtain clearance from the Architect/Engineer that the site preparation work is complete and acceptable. All layout work shall be done by competent and experienced personnel. Lines, angles, dimensions, and heights shall conform to the requirements of the drawings, both as to the construction itself and as to the relation of the construction to the site.

### 3.2 VERIFICATION

A. As a precaution against the possibility of error in the drawings, check and verify all major dimensions and control points shown before actual construction is begun.

1. Any major discrepancies that would affect the work or its cost shall be brought to the attention of the Architect/Engineer for clarification and/or correction before any actual construction is begun; otherwise, the responsibility for the cost of correction shall rest with the contractor.
2. Where existing ground elevations are shown on the drawings, the contractor shall also make enough check shots to verify the general accuracy of existing grade conditions shown.

### 3.3 NOTIFICATION

A. When the work has been laid out, and again before any actual construction is begun, the contractor shall give at least two days' notice to the Architect/Engineer to permit checking of the layout by the Architect/Engineer or his representative before construction is begun. Any errors found as a result of this check shall be corrected.

END OF SECTION 02110

# SECTION 02200 - EARTHWORK

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section. A Report of Geotechnical Investigation was performed by Cal-Tech Testing, Inc. for this site. Their report for Cal-Tech Project No. 05-524, is dated October 20, 2005. The subgrade soils consist primarily of loose sand over medium dense slightly clayey sand.

1. Excavating And Backfilling For Piping And Conduits: Refer to Divisions 15 and 16 for excavation and backfill required in conjunction with underground utilities and buried mechanical and electrical appurtenances.

2. Final Grading, together with placement and preparation of topsoil for lawns and planting, is specified in Division 2 Section, "Landscape Specifications."

### 1.2 DEFINITIONS

A. Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.

1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect/Engineer. Unauthorized excavation, as well as remedial work directed by Architect/Engineer, shall be at Contractor's expense.

   a. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Architect/Engineer.
   b. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Architect/Engineer.

B. Additional Excavation: When excavation has reached required subgrade elevations, notify Architect/Engineer, who will make an inspection of conditions. If Architect/Engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Architect/Engineer. The Contract Sum may be adjusted by an appropriate Contract Modification.

1. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.

C. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular subbase, drainage fill, or topsoil materials.

D. Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

## 1.3 SUBMITTALS

A. Test Reports: Submit the following reports directly to Architect/Engineer from the testing services.

1. Test reports on borrow material.
2. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
3. Field reports; in-place soil density tests.
4. One optimum moisture-maximum density curve for each type of soil encountered.
5. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

## 1.4 QUALITY ASSURANCE

A. Codes And Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

B. Testing And Inspection Service: Contractor shall employ and pay for a qualified independent geotechnical testing laboratory to perform soil testing and inspection service during earthwork operations.

C. Testing Laboratory Qualifications: To qualify for acceptance, the geotechnical testing laboratory must demonstrate to Architect/Engineer's satisfaction, based on

## 1.5 PROJECT CONDITIONS

A. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
2. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Architect/Engineer and then only after acceptable temporary utility services have been provided.

    a. Provide minimum of 48-hour notice to Architect/Engineer, and receive written notice to proceed before interrupting any utility.

3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

B. Use Of Explosives

1. Use of explosives is not permitted.

C. Protection Of Persons And Property

1. Barricade open excavations occurring as part of this work and post with warning lights.

a. Operate warning lights as recommended by authorities having jurisdiction.
b. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
c. Perform excavation by hand within dripline of large trees to remain. Protect root systems from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

C. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, and natural or crushed sand.

D. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.

E. Backfill And Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter. Fill materials shall be clean, fine sand with less than 5 percent soil fines. Fill material with soil fines between 5 percent and 10 percent may be used, however strict moisture control will be required.

## PART 3 - EXECUTION

### 3.1 EXCAVATION

A. Excavation Classifications: The following classifications of excavation will be made when rock is encountered:

1. Earth excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
2. Rock excavation for trenches and pits includes removal and disposal of materials and obstructions encountered that cannot be excavated with a track-mounted power excavator, equivalent to Caterpillar Model No. 215C LC, and rated at not less than 115 HP flywheel power and 32,000-pound drawbar pull and equipped with a short stick and a 42-inch wide, short tip radius rock bucket rated at 0.81 cubic yard (heaped) capacity. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavation.
3. Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered that cannot be dislodged and excavated with modern, track-mounted, heavy-duty excavating equipment without drilling, blasting, or ripping. Rock excavation equipment is defined as Caterpillar Model No. 973 or equivalent track-mounted loader, rated at not less than 210 HP flywheel power and developing minimum of 45,000-pound breakout force (measured in accordance with SAE J732).

    a. Typical of materials classified as rock are boulders ½ cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.
    b. Intermittent drilling or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

B. Do not perform rock excavation work until material to be excavated has been cross-sectioned and classified by Architect/Engineer. Such excavation will be paid on basis of Contract Conditions relative to changes in work.

C. Rock payment lines are limited to the following:

1. Two feet outside of concrete work for which forms are required, except footings.
2. One foot outside perimeter of footings.
3. In pipe trenches, 6 inches below invert elevation of pipe and 2 feet wider than inside diameter of pipe, but not less than 3 feet minimum trench width.
4. Outside dimensions of concrete work where no forms are required.
5. Under slabs on grade, 6 inches below bottom of concrete slab.

## 3.2 FILL SUITABILITY

A. It is anticipated that the onsite soils resulting from excavations will vary, in terms of their suitability for use as engineered backfill and fill. The layer of tan sand (approximately 5 percent soil fines, Unified Soil Classification "SP") will be the most suitable for use as engineered fill. These soils may require some moisture conditioning to facilitate compaction. The clayey sands with less than 30 percent soil fines (Unified Soil Classification "SC") can be used as fill but will require stringent moisture control during placement and compaction, particularly during rainy periods. Very clayey sands, sandy clays and clays shall not be used as fill.

## 3.3 STABILITY OF EXCAVATIONS

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

1. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

B. Shoring And Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

1. Provide permanent steel sheet piling or pressure-creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops a minimum of 2'-6" below final grade and leave permanently in place.

C. Dewatering: The groundwater table will fluctuate seasonally depending upon rainfall. The subsurface investigation report estimates a seasonal high groundwater table could be one foot below the existing grade at the test boring locations. There is no assurance that groundwater levels will not exceed these estimated levels during any given year. Temporary dewatering may be required. If conditions deem it necessary, dewater to the depth of the groundwater table just prior to construction. The groundwater table shall be maintained at least 24 inches below all earthwork and compaction surface.

1. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
2. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
3. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from

excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

D. Storage Of Excavated Materials: Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
2. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

E. Excavation For Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.

1. Excavations For Footings And Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation For Underground Tanks, Basins, And Mechanical Or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection. Do not disturb bottom of excavations, intended for bearing surface.

F. Excavation For Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

G. Trench Excavation for Pipes and Conduit: Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches of clearance on both sides of pipe or conduit.

1. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

    a. Where rock is encountered, carry excavation 6 inches below required elevation and backfill with a 6-inch layer of crushed stone or gravel prior to installation of pipe.
    b. For pipes or conduit less than 6 inches in nominal size, and for flat-bottomed, multiple-duct conduit units, do not excavate beyond indicated depths. Hand-excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.
    c. For pipes and equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom of pipe for 90 degrees (bottom 1/4 of the circumference). Fill depressions with tamped sand backfill. At each pipe joint, dig bell holes to relieve pipe bell of loads ensure continuous bearing of pipe barrel on bearing surface.

H. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

## 3.4 BACKFILL AND FILL

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under grassed areas, use satisfactory excavated or borrow material.
2. Under walks and pavements, use subbase material, satisfactory excavated or borrow material, or a combination.
3. Under steps, use subbase material.
4. Under building slabs, use drainage fill material.
5. Under piping and conduit and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.
6. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

    a. Concrete is specified in Division 3.
    b. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Architect/Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

7. Provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing of piping or conduit, provide minimum 4-inch-thick encasement (sides and top) of concrete prior to backfilling or placement of roadway subbase.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
5. Removal of trash and debris from excavation.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

## 3.5 PLACEMENT AND COMPACTION

A. Ground Surface Preparation: If required, perform dewatering prior to any earthwork operations.

1. Strip the proposed construction limits of all grass, roots, topsoil, construction debris, pavement and other deleterious materials within and 5 feet beyond the perimeter of the proposed building and in all paved areas. Expect clearing and grubbing to depths of 12 inches. Deeper clearing and grubbing depths may be encountered in heavily vegetated areas where major root systems are encountered.
2. Excavate the site to the proposed grades. Stockpile the surficial sandy soils for later use as fill. The subgrade shall then be proof rolled with heavy rubber tired equipment. Proof-rolling helps to locate any zones of especially loose or soft soil not encountered in the soil test borings. Such zones shall be undercut, or otherwise treated as recommended by the Architect. If shrink/swell clay soils or organic silty soils should be encountered near the slab or foundation elevations, contact the Architect for recommendations for their treatment.
3. Compact the subgrade with a heavy vibratory roller (a 10-ton roller, for example) until you obtain a minimum density of 95 percent of the Modified Proctor maximum dry density (ASTM D-1557) to a depth of one foot below the beginning grade prior to placing a fill. All foundations shall have a minimum of one foot of compacted soil beneath the foundation bottom. The subgrade beneath slabs shall be compacted to a depth of one foot. The subgrade beneath pavements shall be compacted to a depth of one foot below the base course or one foot below the beginning grade prior to placing fill.
4. In building areas, perform compliance test on the compacted subgrade at a frequency of one test per 2,500 square feet. In paved areas, perform compliance test on the compacted subgrade and stabilized subgrade for full depth at a frequency of one test per 10,000 square feet, or at a minimum of two test locations, whichever is greater.
5. Place fill material as required. The fill material cona consist of material as indicated elsewhere in this specification. Offsite fill material shall contain less than 10 percent passing the No. 200 sieve. Place backfill and fill in uniform 10 to 12 inch loose lifts and compact each lift to a minimum density of 95 percent of the Modified Proctor maximum dry density.
6. Perform compliance tests within the backfill and fill at a frequency of not less than one test per 2,500 square feet in the building areas, or a minimum of two test locations, whichever is grater. In paved areas, perform compliance tests at a frequency of not less than one test per 10,000 square feet per lift, or at a minimum of two test locations, whichever is greater.
7. Test all footing cuts for compaction to a depth of one foot. Footings that are excavated into the native clayey sands can be probed to verify the subgrade is firm and unyielding. Additionally, test on test per every 200 linear feet of wall footing (monolithic). Footings that are excavated into undisturbed clayey sand shall be visually inspected and probed to verify stability.

B. Existing Structures: Using vibratory compaction equipment at this site may disturb adjacent structures. Contractor shall monitor nearby structures before and during proof compaction. If disturbance is noted, halt vibratory compaction and inform the

Architect/ Engineer immediately. Compaction procedures will be reviewed and evaluated.

1. Percentage Of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 1557:

   a. Under structures, building slabs and steps, and pavements, compact top 12 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.
   b. Under lawn or unpaved areas, compact top 6 inches of subgrade and each layer of backfill or fill material at 90 percent maximum density.
   c. Under walkways, compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.

2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

C. Pavement Stabilized Subgrade: In addition to the other procedures included in this section, stabilize the pavement subgrade materials to a minimum Limerock Bearing Ratio (LBR) of 40 percent as specified by FDOT requirements for Types A & B stabilized subgrade. The stabilized subgrade shall be compacted to 98% of the Modified Proctor maximum dry density.

## 3.6 GRADING

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding.

Finish surfaces free from irregular surface changes and as follows:

1. Lawn Or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.
2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.

3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than ½ inch above or below required subgrade elevation.

C. Grading Surface Of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of ½ inch when tested with a 10-foot straightedge.

D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

## 3.7 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

1. Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D 2167 (rubber balloon method), as applicable.

   a. Field density tests may also be performed by the nuclear method in accordance with ASTM D 2922, providing that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gages in accordance with ASTM D 3017.
   b. If field tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Architect/Engineer.

2. Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Architect/ Engineer. Test all footing cuts for compaction to a depth of one foot.
3. Paved Areas And Building Slab Subgrade: Perform at least one field density test of subgrade for every 2,500 sq. ft. of building slab or 10,000 sq. ft. of paved area, but in no case fewer than two tests. In each compacted fill layer, perform one field density test for every 2,500 sq. ft. of overlaying building slab or 10,000 sq. ft. of paved area, but in no case fewer than two tests.
4. Foundation Wall Backfill: Perform at least two field density tests at locations and elevations as directed.
5. Column Footings: Perform compaction tests at a rate of one out of every four column footings.

If in opinion of Architect/Engineer, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained.

## 3.8 EROSION CONTROL

A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction.

## 3.9 MAINTENANCE

A. Protection Of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

1. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

## 3.10 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal From Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 02200

# SECTION 02230 - SITE CLEARING

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees and vegetation to remain.
2. Removing trees and other vegetation.
3. Clearing and grubbing.
4. Topsoil stripping.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.

### 1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

### 1.4 MATERIALS OWNERSHIP

A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

### 1.5 SUBMITTALS

A. Record drawings according to General Conditions or Division 1 Section "Contract Closeout."

### 1.6 QUALITY ASSURANCE (no specific requirements)

### 1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Notify utility locator service for area where Project is located before site clearing.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 2 Section "Earthwork."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Locate and clearly flag trees and vegetation to remain or to be relocated.

D. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

### 3.2 TREE PROTECTION

A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.

B. Do not excavate within drip line of trees, unless otherwise indicated.

C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Cover exposed roots with burlap and water regularly.
2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
3. Coat cut faces of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect or Engineer.

## 3.3 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange to shut off indicated utilities with utility companies.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect or Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect or Engineer's written permission.

C. Excavate for and remove underground utilities indicated to be removed.

## 3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
4. Use only hand methods for grubbing within drip line of remaining trees.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding 8-inch loose depth, and compact each layer to a density equal to adjacent original ground.

## 3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within drip line of remaining trees.
3. Dispose of excess topsoil as specified for waste material disposal.
4. Stockpile surplus topsoil and allow for respreading deeper topsoil.

## 3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

## 3.7 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 02230

# SECTION 02260 - EXCAVATION SUPPORT AND PROTECTION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes excavation support and protection systems.

B. Related Sections include the following:

1. Division 1 Section "Construction Facilities and Temporary Controls."
2. Division 2 Section "Earthwork" for excavating and backfilling.

### 1.3 PERFORMANCE REQUIREMENTS

A. Design, provide, monitor, and maintain an anchored and braced excavation support and protection system capable of resisting soil and hydrostatic pressure and supporting sidewalls of excavations.

1. Work includes removing excavation support and protection systems when no longer needed.
2. Prevent surface water from entering excavations by grading, dikes, or other means.
3. Install excavation support and protection systems without damaging existing buildings, pavements, and other improvements adjacent to excavation.

### 1.4 SUBMITTALS

A. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems. System design and calculations must be acceptable to authorities having jurisdiction.

1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.

B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by excavation support and protection systems.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing excavation support and protection systems similar to those required for this Project and with a record of successful in-service performance.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services for designing excavation support and protection systems that are similar to those indicated for this Project in material, design, and extent.

1. Engineering Responsibility: Engage a qualified professional engineer to prepare or supervise the preparation of data for the excavation support and protection system including drawings and comprehensive engineering analysis that shows the system's compliance with specified requirements.

## 1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted in writing by the Architect and then only after arranging to provide temporary utility services according to requirements indicated.

B. Project Site Information: A geotechnical report has been prepared for this Project and is available for information only. The report is not part of the Contract Documents. The opinions expressed in this report are those of the geotechnical engineer and represent interpretations of the subsoil conditions, tests, and results of analyses conducted by the geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.

1. Make additional test borings and conduct other exploratory operations as necessary.
2. The geotechnical report is referenced elsewhere in the Project Manual.

C. Survey adjacent structures and improvements, employing a qualified professional engineer or surveyor; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

## 1.7 PAYMENT **Cost for this work must be specifically included as part of bid price.**

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Materials need not be new but must be in serviceable condition.

B. Structural Steel: ASTM A 36 (ASTM A 36M).

C. Steel Sheet Piling: ASTM A 328 (ASTM A 328M) or ASTM A 572 (ASTM A 572M)

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of 3 inches (75 mm).

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

C. Locate excavation support and protection systems clear of permanent construction and to permit forming and finishing of concrete surfaces.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

### 3.2 SOLDIER BEAMS AND LAGGING

A. Install steel soldier piles before stating excavation. Space soldier piles at intervals indicated. Accurately align exposed faces of flanges to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at centers indicated and secure to soldier piles.

## 3.3 SHEET PILING

A. Install one-piece sheet piling and tightly interlock to form a continuous barrier. Accurately align exposed faces of sheet piling to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

## 3.4 TIEBACKS

A. Tiebacks: Drill for, install, tension, and grout tiebacks into position. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

## 3.5 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work, unless otherwise approved by Architect.
2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

## 3.6 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches (1200 mm) below overlying construction and abandon remainder.
2. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 02260

# SECTION 02282 - TERMITE CONTROL

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including general and Supplementary Conditions and Division - 1 Specification sections, apply to work of this section.

### 1.2 SUMMARY

A. Provide soil treatment for termite control, as herein specified.

### 1.3 PRODUCT DATA SUBMITTALS

A. Submit manufacturer's technical data and application instructions, using Material Safety Data Sheet and product label in most up-to-date form. Provide MSDS forms on jobsite during installation.

### 1.4 QUALITY ASSURANCE

A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.

1. Engage a professional pest control operator, licensed in accord with regulations of governing authorities for application of soil treatment solution.
2. Use only termiticides which bear a Federal registration number of the U.S. Environmental Protection Agency.
3. Deliver product to jobsite in sealed containers, then mixed with water on site per governing law.

### 1.5 JOB CONDITIONS/RESTRICTIONS

A. Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations and not until plumbing inspection on below-floor slab plumbing is complete.

1. To insure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.
2. Cover treated areas within two hours of soil treatment as recommended by the treatment product manufacturer.

### 1.6 SPECIFIC PRODUCT WARRANTY

A. Furnish written warranty certifying that applied soil termiticide treatment will prevent infestation of subterranean termites, and that Contractor will re-treat soil and repair or replace damage caused by subterranean termite infestation.

1. Provide warranty for a period of 5 years from date of treatment, signed by Applicator and Contractor.

## PART 2 - PRODUCTS

### 2.1 SOIL TREATMENT SOLUTION

A. Use an emulsible concentrate termiticide for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent. Subject to compliance with requirements, provide a solution consisting of the following chemical elements and concentrations or pre-approved equal:

1. Chloropyrifos ("Dursban TC"); 1.0 percent in water emulsion.

Other solutions may be used as recommended by Applicator only if pre-approved as equal, for intended application, by the Owner, the Architect/Engineer and jurisdictional authorities. Use only soil treatment solutions which are not injurious to planting.

## PART 3 - EXCAVATION

### 3.1 GENERAL

A. No treatment shall be made when the soil or fill is excessively wet or immediately after heavy rains, to avoid surface flow of toxicant from applicated areas. Unless treated areas are to be immediately covered, take precautions to prevent disturbance of treatment.

### 3.2 APPLICATION

A. Surface Preparation: Remove any foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placement of compacted fill under slabs, recommended by toxicant manufacturer.

B. Application Rates: Apply soil treatment solution as follows:

1. Under slab-on-grade structures, treat soil before concrete slabs are placed, using the following rates of application:

   a. Apply 4 gallons of chemical solution per 10 lin. ft. to soil in critical areas under slab, including entire inside perimeter inside of foundation walls, along both sides of interior partition walls, around plumbing pipes and electrical conduit penetrating slab, areas immediately below control and expansion joints and where other construction items penetrate floor slabs.
   b. Apply one gallon of chemical per 10 sq. ft. as an overall treatment under slab and attached slab areas where fill is soil.
   c. Apply 4 gallons of chemical solution per 10 lin. ft. of trench, for each foot of depth from grade to footing, along outside edge of building. Dig a trench 6" to 8" wide along the outside of foundation to a depth of not less than 12". Punch holes to top of footing at not more than 12" o.c. and apply chemical solution. Mix chemical solution with the soil during its replacement in the trench.

d. At expansion joints, control joints, and areas where slabs will be penetrated, apply at a rate of 4 gallons per 10 lin. ft. of penetration.

2. Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs when areas are covered by other construction.
3. Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application. Reapply soil treatment if treated areas are not covered, per the treatment product manufacturer's recommendations, within two hours of treatment or if the area treated is soaked due to inclement weather.

END OF SECTION 02282

# SECTION 02511 - HOT-MIX ASPHALT PAVING

## PART 1 – GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Hot-mix asphalt paving.
2. Hot-mix asphalt patching.
3. Pavement-marking paint.
4. Wheel stops.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for aggregate subbase and base courses and aggregate pavement shoulders.

### 1.3 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the state or of authorities having jurisdiction.

1. Standard Specification: As indicated.
2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

### 1.4 SUBMITTALS

A. Product Data: For each product specified. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: For each job mix proposed for the Work.

C. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate dedicated handicapped spaces with international graphics symbol.

D. Qualification Data: Include lists of completed projects with project names and addresses, names and addresses of Architect or Engineers and owners, and other information specified.

E. Material Test Reports: Indicate and interpret test results for compliance of materials with requirements indicated.

F. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.

1. Firm shall be a registered and approved paving mix manufacturer with authorities having jurisdiction or with the DOT of the state in which Project is located.

C. Testing Agency Qualifications: Demonstrate to Architect or Engineer's satisfaction, based on Architect's evaluation of criteria conforming to ASTM D 3666, that the independent testing agency has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

D. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.

E. Asphalt-Paving Publication: Comply with AI's "The Asphalt Handbook," except where more stringent requirements are indicated.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

## 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:

1. Prime and Tack Coats: Minimum surface temperature of 60 deg F.
2. Slurry Coat: Comply with weather limitations of ASTM D 3910.
3. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.

4. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

## PART 2 - PRODUCTS

### 2.1 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wettable powder form.

B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

C. Paving Geotextile: Nonwoven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.

D. Pavement-Marking Paint: Latex, water-base emulsion, ready-mixed, complying with FS TT-P-1952.

1. Color: As indicated.

E. Glass Beads: AASHTO M-247.

F. Wheel Stops: Precast, air-entrained concrete, 3000-psi minimum compressive strength, approximately 6 inches high, 9 inches wide, and 72 inches long. Provide chamfered corners and drainage slots on underside, and provide holes for anchoring to substrate.

1. Dowels: Galvanized steel, diameter 3/4 inch, minimum length 18 inches.

### 2.2 MIXES

A. Hot-Mix Asphalt: Per Florida Department of Transportation (FDOT) standard specifications and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: As indicated on the drawings.
3. Surface Course: As indicated on the drawings.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Notify Architect or Engineer in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

### 3.2 COLD MILLING

A. Clean existing paving surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement, including hot-mix asphalt and, as necessary, unbound-aggregate base course, by cold milling to grades and cross sections indicated.

1. Repair or replace curbs, manholes, and other construction damaged during cold milling.

### 3.3 PATCHING AND REPAIRS

A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.

1. Tack coat faces of excavation and allow to cure before paving.
2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Pump hot undersealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
2. Remove disintegrated or badly broken pavement. Prepare and patch with hot-mix asphalt.

C. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

D. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch. Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

E. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. of surface.

1. Allow tack coat to cure undisturbed before paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

## 3.4 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared base is ready to receive paving.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat when formulated by manufacturer for that purpose.

C. Prime Coat: Apply uniformly over surface of compacted-aggregate base at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

## 3.5 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at minimum temperature of 250 deg F.

4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide, except where infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base course for a section before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

## 3.6 JOINTS

A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat.
2. Offset longitudinal joints in successive courses a minimum of 6 inches.
3. Offset transverse joints in successive courses a minimum of 24 inches.
4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

## 3.7 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

## 3.8 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch .
2. Surface Course: Plus 1/4 inch, no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch .
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

## 3.9 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect or Engineer.

B. Allow paving to cure for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal..

## 3.10 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than 2 galvanized steel dowels embedded in precast concrete at one-third points. Firmly bond each dowel to wheel stop and to pavement.

1. Extend upper portion of dowel 5 inches into wheel stop and lower portion a minimum of 5 inches into pavement.

## 3.11 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.

1. Reference laboratory density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 1559, and compacted according to job-mix specifications.
2. Reference maximum theoretical density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
3. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, but in no case will fewer than 3 cores be taken.

b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 02511

# SECTION 02630 - STORM DRAINAGE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes storm drainage outside the building.

### 1.3 DEFINITIONS

A. PE: Polyethylene plastic.

B. PVC: Polyvinyl chloride plastic.

C. RCP: Reinforced Concrete Pipe.

### 1.4 SUBMITTALS

A. Product Data: For pipe, fitting, and accessories.

B. Shop Drawings: Include plans, elevations, details, and attachments for the following:

1. Precast concrete manholes and other structures, including frames, covers, and grates.
2. Cast-in-place concrete manholes and other structures, including frames, covers, and grates.

C. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

## 1.6 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect or Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect or Engineer's written permission.

## PART 2 - PRODUCTS

**2.1** PIPES AND FITTINGS: Pipe and fittings materials shall be as indicated on the drawings and shall comply with the following requirements as appropriate:

A. Corrugated-Steel Pipe: ASTM A 760/A 760M, Type I, made from ASTM A 929/A 929M, zinc-coated steel sheet for banded joints.

1. Fittings: Fabricated to types indicated and according to same standards as pipe.
2. Connecting Bands: Standard couplings made for corrugated-steel pipe to form soil tight joints.

B. Corrugated PE Drainage Tubing and Fittings: AASHTO M 252, Type S, with smooth waterway for coupling joints.

1. Soil tight Couplings: AASHTO M 252, corrugated, matching tube and fittings to form soil tight joints.
2. Silt tight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings to form silt tight joints.

C. Corrugated PE Pipe and Fittings: AASHTO M 294, Type S, with smooth waterway for coupling joints.

1. Soil tight Couplings: AASHTO M 294, corrugated, matching pipe and fittings to form soil tight joints.
2. Silt tight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings to form silt tight joints.

D. PVC Pressure Pipe: AWWA C900, Class 150, for gasketed joints.

1. PVC Pressure Fittings: AWWA C907, for gasketed joints.
2. Gaskets for PVC Piping: ASTM F 477, elastomeric seals.
3. Ductile-Iron, Compact Fittings: AWWA C153, for push-on joints.
4. Gaskets for Ductile-Iron Fittings: AWWA C111, rubber.

E. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Class III, Wall B, for gasketed joints.

1. Gaskets: ASTM C 443, rubber.

F. Reinforced-Concrete Arch Pipe: ASTM C 506, Class IV, for banded joints.

1. Sealing Bands: ASTM C 877, Type I.

G. Reinforced-Concrete Elliptical Pipe: ASTM C 507, Class IV, for banded joints.

1. Pattern: Type HE, horizontal.
2. Pattern: Type VE, vertical.
3. Sealing Bands: ASTM C 877, Type I.

## 2.2 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Diameter: 48 inches minimum, unless otherwise indicated.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Gaskets: ASTM C 443, rubber.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section or cement mortar grout.

B. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch- diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

## 2.3 CATCH BASINS

A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth and size indicated, with provision for rubber gasketed joints.

B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches minimum, unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

## 2.4 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

## 2.5 PROTECTIVE COATINGS

A. Description: Two-coat, coal-tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:

1. Concrete Manholes: On exterior surface.
2. Catch Basins: On exterior surface.

## 2.6 PIPE OUTLETS

A. Head walls and endwalls as indicated on the drawings.

# PART 3 - EXECUTION

## 3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

## 3.2 IDENTIFICATION

A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installing warning tapes directly over piping and at outside edges of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

## 3.3 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.

## 3.4 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Corrugated-Steel Pipe: Join and install according to ASTM A 798. Use standard joints made with coupling bands, unless otherwise indicated.

C. PE Pipe and Fittings: As follows:

1. Join pipe, tubing, and fittings with couplings for soil tight joints according to manufacturer's written instructions.
2. Install according to ASTM D 2321 and manufacturer's written instructions.
3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."

D. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:

1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.
2. Elliptical Pipe: ASTM C 877, Type I, sealing bands.
3. Arch Pipe: ASTM C 877, Type I, sealing bands.

E. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

## 3.5 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

E. Construct cast-in-place manholes as indicated.

## 3.6 CATCH-BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

## 3.7 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

## 3.8 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Structures: Excavate around structure as required and use one procedure below:

1. Remove structure and close open ends of remaining piping.
2. Remove top of structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
3. Backfill to grade according to Division 2 Section "Earthwork."

## 3.9 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plug in end of incomplete piping at end of day and when work stops.
3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

END OF SECTION 02630

# SECTION 02668 - DOMESTIC WATER SYSTEMS AND PRESSURIZED SANITARY SEWAGE FORCE MAINS

## PART 1 - GENERAL

**1.1** The purpose of this section is to provide for the furnishing and installation of all materials, equipment and apparatus to be used in the water facilities.

## PART 2 - PRODUCTS

**2.1** **PLASTIC PIPE SMALLER THAN 4"** shall be schedule 40. Plastic pipe 4 to 8 inches nominal diameter shall be polyvinyl chloride (PVC) manufactured in accordance with AWWA STANDARD C-900. The pipe shall be designed in accordance with these specifications with a designed pressure of 150 PSI at 73 F. All pipe shall be Johns-Manville PVC pipe with ring-tite joints or equal. The pipe shall be furnished in nominal 20-foot lengths and shall have the following properties:

| SIZE | O.D. AVERAGE | MINIMUM WALL THICKNESS |
|---|---|---|
| 4" | 4.800" | 0.267" |
| 6" | 6.900" | 0.383" |
| 8" | 9.050" | 0.503" |

A. Plastic pipe one inch nominal diameter and smaller, and which is used for service lines, shall be Schedule 40, equal to CERTAINTEED PS 21-70.

B. All plastic pipe shall meet the approval of the National Sanitary Foundation and each section of pipe must be clearly stamped with the seal of approval, pipe material and pressure rating.

**2.2 PLASTIC PIPE JOINTS, FITTINGS AND ADAPTORS**

A. Plastic pipe fittings and adaptors for pipe 2 inches in size shall be furnished by the same manufacturer that furnishes the plastic pipe. Tees, ells, and similar fittings shall be solvent-welded and tested at the manufacturer's plant. Joints shall be John-Mansville ring-tite joints or equal. Plugs, caps and reducers may be cemented in accordance with manufacturer's recommendations. Adaptors with ring-tite joints shall be used for connecting plastic pipe to valves and to asbestos cement, cast iron or galvanized steel pipe and fittings. Fittings shall be schedule 40 or heavier.

B. Joints for plastic service pipe shall be solvent weld for standard corporation stops, curb stops, and meter stops, etc.

C. Threaded joints will not be permitted for plastic pipe of any size.

## 2.3 CAST IRON FITTINGS

All cast iron pipe fittings shall be designed for use with the pipe purchased under these specifications and shall be made by a manufacturer member of the Cast Iron Pipe Research Association. Fittings shall be of not less than Class 150. Fittings shall be furnished with a half-thickness cement interior lining with seal coat or "Enameline" lining, and shall be bituminous enamel coated on the outside, ANSI Specification A21.10. Install cast iron fittings on 4" pipe and larger. Fitting joints shall be mechanical joint fittings conforming to ANSI specification A211.11 manufactured specifically for asbestos-cement, cast iron pipe, or PVC pipe.

## 2.4 GATE VALVES

A. All valves in sizes from 2 inches up to and including 12 inches shall be AWWA Standard, iron body, fully bronze mounted, double disc, inside screw, water gate valves suitable for 150 PSI working pressure.

B. Valves in sizes 1 1/2 inches and smaller shall be 125 lb. brass gate valves with wedge disc and non-rising stem equal to Crane Catalog No. 438.

C. Valves for connection to asbestos-cement pipe shall have mechanical joints or slip-joints and valves for connection to plastic pipe shall have screwed or slip joints with adaptors as shown on the plans. All valves shall open counterclockwise.

D. Each valve 2 inches and larger shall be provided with 2 inch square wrench nut, and each valve 1 1/2 inches and smaller shall be provided with hand wheel.

## 2.5 ROADWAY VALVE BOXES

Each gate valve shall be protected by a cast iron roadway box similar and equal to Mueller No. H-10360. Covers shall be marked "WATER". Provide concrete pad as shown on the plans.

## 2.6 WATER METERS

A. New water meters shall be magnetic drive, displacement type, cold water meters meeting AWWA specification C700-46. Meter registers shall be straight-reading, indicating in gallons (American or equal).

B. Each meter shall be installed with meter stop and coupling as shown on the plans.

## 2.7 WATER METER BOXES

Water meter boxes shall be as specified on the plans.

## 2.8 CONCRETE

Concrete for reaction backing, supports, curb and gutter replacement, and other concrete work shall be transit-mix concrete having a compressive strength of not less than 3,000 PSI at 28 days. Hand mixing will not be permitted.

## 2.9 SERVICE SADDLES

A. Service saddles for cast iron, asbestos-cement and galvanized steel pipe shall be made of malleable iron and shall have a gasket of neoprene. Saddle bolts shall be electro-plated, iridite-dipped bolts. Tap saddles according to API Specifications for iron pipe connections and to Mueller thread specifications for corporation stop connections.

B. Service saddles for plastic pipe shall be the wide saddle clamp type specially designed for use on plastic pipe. A corporation stop or curb stop shall be included as an integral part of the saddle and the service outlet shall be suitable for connection to PB plastic service line. Dresser Style 194, or equal, with saddle gaskets.

## 2.10 CORPORATION STOPS, ETC.

Corporation stops, curb stops, meter connectors, etc. shall be made of bronze and shall be of the type shown on the plans. Plastic pipe clamps and screws shall be made of stainless steel.

## 2.11 FIRE HYDRANTS

A. Fire hydrants shall be MUELLER or M&H cast iron body, full bronze mounted compression type hydrants meeting AWWA Specification C502-54 with 6-inch mechanical joint inlet connection. Valve opening shall be 5 1/4 inches. Hydrants shall be suitable for 150-pound working pressure and shall be equipped with one 4 1/2 inch pumper connection with two 2 1/2 inch hose connections. Nozzles shall have chains and caps and shall be in accordance with ASA Specification B26, National Standard Fire-Hose Coupling Screw Thread. Furnish safety flange with safety stem coupling so as to prevent breakage of hydrant barrel and operating stem. Valve to open counterclockwise.

B. The Contractor shall paint each hydrant after installation. The color shall be designated by the Owner.

## 2.12 BACKFLOW PREVENTION

All metered service lines shall have a backflow preventer. The backflow preventer shall be a WATTS PRODUCT, 3" Dual Check Backflow Preventer, or equal.

## PART 3 - EXECUTION

### 3.1 INSPECTION AND DISPOSITION OF DEFECTIVE MATERIALS

A. All pipe and accessories shall be laid, jointed, and tested under pressure for defects and leakage in the manner specified and in the presence of and as approved by the Engineer.

B. All materials found during the progress of the work to have cracks, flaws, or other defects, or to have surface abrasions resulting from undue strain during shipping or handling, will be rejected by the Engineer.

C. Rejected materials shall be removed from the job site by the Contractor without delay.

### 3.2 WELL POINTS

The Engineer will direct the Contractor to use well points when he deems necessary.

### 3.3 HANDLING MATERIAL

A. Pipe, fittings, valves, and accessories shall be loaded and unloaded by hand or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

B. In disturbing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench.

### 3.4 PROTECTION OF PROPERTY AND OBSTRUCTIONS

A. Temporary support, adequate protection and maintenance of all underground and surface structures, water lines, drains, and other obstructions encountered in the progress of the work shall be installed. The structures which may have been disturbed shall be restored upon completion of the work.

B. All known obstructions are shown on the plans; however, the Contractor shall verify these on the ground and provide for all obstructions encountered and shall use utmost caution in all operations to avoid damage to existing pipes, conduits, cables, pole lines, structures, etc., whether or not shown on the plans. Any damage to existing structures or utilities shall be repaired or made good by the Contractor at no expense to the Owner.

C. The Owner shall obtain the necessary permits for construction across public and private property, streets, railroads, telephone lines, power lines, etc. The Contractor shall abide by all rules, regulations, and requirements of the owners of such property in regard to the construction under this Contract, including the

giving of notices, provisions for inspection, and employment of such methods of construction as may be required. Wherever additional costs are incurred due to such requirements, all such costs shall be included in the prices bid. No additional compensation will be allowed for such costs after award of the Contract.

D. The intent of the specifications is for the Contractor to be entirely responsible for all obstructions, regardless of whether or not shown on plans. Any obstructions encountered at any time and in any location shall be provided for in the most practical manner. In the case of utilities, they shall be kept in operation. Should it become necessary to install temporary lines, temporary pumps, or other means be provided for the continuous operation of utilities, all this work shall be done, maintained, operated, and removed upon completion, at no additional cost to the Owner.

## 3.5 ALIGNMENT, GRADE AND COVER

A. Water mains shall be laid and maintained to the required lines and grades with fittings and valves at the required locations; spigots centered in bells; and all valve stems plumb.

B. Wherever obstructions not shown on the plans are encountered during the progress of the work and interfere to such an extent that alteration in the plan is required, the Engineer shall have the authority to change the plans and order a deviation from the line and grade or arrange with the owners of the structures for the removal, relocation, or reconstruction of the obstructions.

C. The work shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined to permit revision of grade or alignment as necessary (as determined by the Engineer) to bypass within the permissible deflection of the pipe joints.

D. All water mains shall be laid to the depth shown on the plans, or with a minimum cover of 30 inches from established grade if not otherwise indicated.

## 3.6 SHEETING AND BRACING

A. Open cut trenches shall be sheeted and braced as required by OSHA and any governing state laws and municipal ordinances, and as may be necessary to protect life, property, or the work. When close sheeting is required, it shall be so driven as to prevent adjacent soil from entering the trench either below or through such sheeting. Where sheeting and bracing are used, the trench width shall be increased accordingly.

B. Sheeting and bracing which have been ordered left in place must be removed for a distance of three feet below the established street grade or the existing surface of the street, whichever is lower. Trench bracing, except that which must be left in place, may be removed when the backfilling has reached the respective levels of such bracing.

## 3.7 LAYING AND JOINTING CAST IRON AND DUCTILE IRON PIPE

A. Cast iron pipe and fittings shall be inspected for defects and while suspended above grade.

B. All lumps, blisters, and excess coal tar coating shall be removed from the bell and spigot end of each pipe, and the outside of the spigot and the inside of the bell shall be wire brushed and wiped clean and dry and free from oil and grease before the pipe is laid.

C. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved backfill material tamped under it except at the bells. Pipe and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space. Precautions shall be taken to prevent dirt from entering the joint space.

D. The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe cement lining and so as to leave a smooth end at right angles to the axis of the pipe.

E. All mechanical joints shall be made up in strict accordance with the manufacturer's specifications, using such special tools as stipulated by him. Gaskets shall be evenly spread, the gland spaced in position, and bolts hand tightened before final tightening by wrenches.

## 3.8 LAYING AND JOINTING PLASTIC PIPE

Plastic pipe shall be handled in accordance with the manufacturer's printed instructions and as shown on the plans. Special attention shall be given to protecting the pipe and fittings from handling and heat damage. Materials shall be stored out of direct sunlight and heat. Joints shall be made up with proper seating space. Heat bending is not permitted.

## 3.9 SETTING VALVES AND FITTINGS

A. Valves, fittings, plugs, and caps shall be set and jointed to pipe in the manner heretofore specified for cleaning, laying, and jointing pipe.

B. A roadway valve box shall be provided for every valve.

C. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement or such other level as may be directed. A concrete pad shall be constructed around the box cover as shown on the plans.

D. All dead ends on new mains shall be terminated with blow-off valves, cast iron plugs, or caps as shown on the plans.

## 3.10 ANCHORAGE

A. All plugs, caps, tees, and bends deflecting 22-1/2 degrees or more on cast iron asbestos-cement or slip-joint plastic pipe shall be provided with reaction backing or movement shall be prevented by attaching suitable metal rods or clamps as shown or specified.

B. Reaction backing shall be ready-mix concrete. Backing shall be placed between solid ground and the fittings to be anchored; the area of bearing on the pipe and on the ground in each instance shall be that shown or directed, be so placed that the pipe and fitting joints will be accessible for repair.

C. Metal harness or tie rods or clamps of adequate strength to prevent movement may be used instead of concrete backing, as directed by the Engineer. Steel rods or clamps shall be galvanized or otherwise rust-proof treated, or shall be painted as shown or directed by the Engineer.

## 3.11 HYDROSTATIC TESTS

A. After the pipe has been laid and backfilled between joints, all newly laid pipe, or any valved section thereof, shall be subjected to a hydrostatic gauge pressure of 150 PSI in accordance with provisions of AWWA C600 or C605/M23, as applicable. All visible leaks shall be stopped by approved method.

B. The duration of each pressure test shall be at least two consecutive hours.

C. Each valved section of pipe shall be slowly filled with water and the specified test pressure, based on the elevation of the lowest point of the line or section under test, and corrected to the elevation of the test gauge, shall be applied by means of a gasoline or electric driven test pump connected to the pipe in a manner satisfactory to the Engineer. The Contractor shall make arrangements for metering the amount of water used during the test.

D. All joints shall be left completely open during the test. If they become covered, they shall be re-dug. If the ditch is wet, each joint shall be pumped dry for inspection of loose bolts and leaks. Sufficient manpower shall be employed to insure the inspection of each joint during the two-hour test period.

E. Before applying the specified test pressure, all air shall be expelled from the pipe. If blow-offs are not available at high places, taps at points of highest elevation shall be made before the test is made and plugs inserted after the test has been completed.

F. All exposed pipes, fittings, valves and joints will be carefully examined during the open-trench test. Any cracked or defective pipes, fittings, or valves discovered in consequence of this pressure test shall be removed and replaced with sound material and the test shall be repeated until satisfactory to the Engineer.

G. A leakage test shall be conducted at above mentioned pressure of 150 PSI.

H. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and air expelled.

I. No pipe installation shall be accepted until the leakage is less than the following leakages per thousand feet of main excluding the service pipe lines:

| | |
|---|---|
| 4" and less | 0.33 gallons per hour |
| 6" | 0.50 gallons per hour |
| 8" | 0.66 gallons per hour |
| 10" | 0.83 gallons per hour |
| 12" | 0.99 gallons per hour |

Where any section of a main is provided with concrete reaction backing the hydrostatic pressure test shall not be made until at least seven days have elapsed after the concrete reaction backing was installed. If high early-strength cement is used in the concrete reaction backing, the hydrostatic pressure test shall not be made until at least three days have elapsed.

## 3.12 SERVICES CONNECTIONS AND SERVICE WATER PIPE

A. The Contractor shall tap the mains and install the water service connections including service pipe and water meter stop, before the hydrostatic and leakage tests are made. The service connections and service pipe shall be included in the hydrostatic and leakage tests. Taps shall be made at the locations designated by the Engineer. Standard tapping machines designed for the pipe material to be tapped shall be used and extreme care shall be exercised to recover and remove from the pipe line all pipe material cut during the tapping process.

B. The service pipe shall be connected to each service connection and shall be run to a point 6 inches inside the property line at a location designated by the Engineer. Service water pipe shall be of the same nominal size as the service connection.

C. Minimum cover on service pipe shall be 20 inches.

D. Each service water pipe line shall be terminated with a water meter stop, as shown on the plans. The meter shall not be installed until the water distribution system has been sterilized and each meter stop opened to allow thorough flushing of the service connection and pipe.

## 3.13 METER CONNECTIONS AND METER BOXES

The Contractor shall install a meter connection and a meter box at the end of each service pipe line and as shown on the plans.

## 3.14 STERILIZATION

Upon completion of all testing, the Contractor shall furnish all labor, equipment, and do all work necessary to sterilize the water mains in accordance with the applicable sections of AWWA Specification C651 and the local health department requirements. The Owner will furnish the Contractor with sufficient quantities of water for sterilization. The Contractor will furnish and place the sterilizing agent. The sterilizing agent shall be left in the main for a period of not less than 24 hours. Then the main shall be thoroughly flushed and the Contractor shall sample the distribution system bacteriologically and shall obtain approval of the health authorities. No newly laid mains shall be placed in service until approval of the health authorities has been obtained.

## 3.15 CLEANUP

When the work is completed, the Contractor shall remove from the site all waste material or other debris caused by or accumulated as a result of his work. He shall refill depressions or holes resulting from settlement of backfill in trenches and shall leave the site in a condition satisfactory to the Engineer.

END OF SECTION 02668

## SECTION – 02730 SANITARY SEWAGE SYSTEMS

## PART 1 - GENERAL

**1.1** The work includes furnishing all materials, labor, and equipment and performing all work necessary to construct and place in operation the gravity sewer system as shown on the plans and/or herein described and specified. The gravity sewer systems covered under this section comprise lines, mains, trunks, manholes, and all other incidental items such as excavation, backfill, pavement repair, supports, sheeting, bracing, or other work which may be reasonably implied as necessary to complete the systems in full accordance with the specifications and drawings.

**1.2** **THE CONTRACTOR SHALL PROVIDE FACILITIES** and be responsible for the protection of all structures, building and utilities, underground, on the surface or above ground, against trenching, dewatering, or any other activity connected with the construction or operation of these lines and structures during the construction period and the one (1) year guarantee period and protect and preserve the Owner harmless against all claims for such damage.

**1.3** **IN THE CONTRACTOR'S** use of streets and highways for the work to be done under these specifications, he shall conform to all City, State, and local laws and regulations. The Contractor shall provide, erect, and maintain effective barricades, danger signals, and signs on all intercepted streets or highways for protection of the work and the safety of the public. All barricades or obstructions that encroach on or are adjacent to public rights-of-ways shall be provided with lights which shall be kept burning at all times between sunset and sunrise. The Contractor shall be responsible for all damages resulting from any neglect or failure to meet these requirements stated herein, same shall be furnished without extra cost to the Owner by the Contractor.

**1.4** **THE CONTRACTOR SHALL ARRANGE** his work to cause minimum disturbance of normal pedestrian and vehicular traffic and will be held responsible for providing suitable means of access to all public and private properties during all stages of the construction. Should the construction require repairs, changes, or modifications of other utilities, it shall be the responsibility of the Contractor to provide for the maintenance of continuous water, electric, telephone, and gas as well as sewage and other utility services to all present customers of such utilities, unless approval in writing is secured from the utility company for interruption of such services.

**1.5** **IN CERTAIN LOCATIONS** it will be necessary to install sewer lines in private property. In these locations, an easement for installation of the line will be secured by the Owner. In locations where the work is to be installed in streets or road rights-of-way the activities of the Contractor shall be confined to these public properties. Where the use of private property is deemed necessary by the Contractor to facilitate construction work, arrangement for such use with the property owner shall be the responsibility of the Contractor. The Contractor shall

save the Owner harmless from all claims by adjacent property owners for trespass or damage due to the activities of the Contractor in the prosecution of the work.

## PART 2 - PRODUCTS

### 2.1 PVC PIPE

A. Unplasticized polyvinyl chloride (PVC) plastic gravity sewer pipe with integral wall bell and spigots joints for the conveyance of domestic sewage.

B. Pipe and fittings shall meet extra strength minimum of SDR = 35 of the requirements of ASTM specifications D3034. Pipe shall be Johns-Manville ring-tite PVC gravity sewer or equal.

C. PVC gravity system shall be installed according to the applicable sections of these specifications.

### 2.2 DUCTILE IRON SEWER PIPE AND FITTINGS

A. Sewer pipe shall be ductile iron pipe manufactured in accordance with ANSI specification A21.51 of the latest revision, and shall be centrifugally cast. Pipe shall be furnished in standard 18 or 20 foot lengths. Fittings shall be ductile iron, and shall be manufactured in accordance with ANSI specification A21.10 of the latest revision.

B. Pipe and fittings shall be furnished with standard bituminous enamel coating outside with cement lining inside in accordance with ANSI A21.4.

C. All pipe joints shall be furnished complete with all necessary joint material. Push-on type joints shall be Tyton as manufactured by the United States Pipe and Foundry Company, Fastite as manufactured by the American Cast Iron Pipe Company, Super Bell Tite as manufactured by James B. Clow and Sons, Inc., or approved equal. Push-on joints shall be manufactured in accordance with ANSI specification A21.11 of the latest revision.

D. The pipe manufacturer shall furnish the owner a certificate that all tests and inspections have been complied with as required by the specification under which the pipe is manufactured.

E. No ductile iron pipe shall be furnished having a standard metal thickness class less than Class 2.

2.3 **MANHOLE FRAMES AND COVERS** shall be similar and equal to Clow F-3240-1. Manhole cover shall be similar and equal to Clow Style I. Material shall be tough, dense, and even-grained iron cast in a true symmetrical pattern. Frames and covers shall be free from warping, scale, lumps, blister, sandholes or defects of any kind, and shall be machined at touching surfaces so as to seat firmly and prevent rocking or rattle when cover is placed on frame. Any set not matching shall be removed and replaced at contractor's expense.

**2.4 CONCRETE SHALL BE AS SPECIFIED** in SECTION 03 300, Concrete Work.

**2.5 BRICK FOR MANHOLE** and other brick construction shall be standard common brick, 85% hard burned solid side cut, 2-1/4" by 3-3/4" by 8".

**2.6 GRANULAR MATERIAL** shall be crushed stone or pea gravel conforming to ASTM C33-67, Size No. 7, having the following grading by weight: 100 percent passing 3/4-inch sieve; 90-100 percent passing 1/2-inch sieve; 40-70 percent passing 3/8-inch sieve; 0-15 percent passing No. 4 sieve; 0-5 percent passing 8 sieve.

## PART 3 - EXECUTION

### 3.1 PRELIMINARY WORK

A. The Contractor shall clear all rights-of-way and remove obstructions along all pipe lines for a sufficient area to provide adequate work space, including space for Engineer's stakes, hubs, bench-marks, and batter boards. Removal of trees and permanent structures along or in the right-of-way shall be done by the Contractor, but only as directed by the Owner or Engineer. Valuable trees or shrubs within the work area which are to remain shall be clearly marked by the Owner or Engineer. The Contractor shall take every reasonable precaution to avoid damaging the remaining valuable trees and shrubs. Where such avoidable damage shall occur, the Contractor shall at his expense replace the damaged vegetation with like or similar vegetation as directed by the Owner or Engineer.

B. Prior to the commencement of trench excavation, the Contractor shall prepare and submit to the Engineer for approval, detailed Cut Sheets showing the beginning and ending manholes; the distance between manholes; the grade, size and type of line; the depth of cut; etc. The form of Cut Sheets shall be as shown in Exhibit 1 of this section. All expense for the preparation of cut sheets shall be borne by the Contractor and be included in the unit price per foot of pipe.

C. Cut Sheets must be approved by the Engineer in writing before trenching operations may be permitted. It shall be the responsibility of the Contractor to prepare Cut Sheets far enough in advance of his anticipated trenching schedule so that avoidable delay in the work will not occur.

### 3.2 CONFLICTS

A. Underground structures shown on the plans are according to the best available information but it shall be the Contractor's responsibility to acquaint himself with all information and to avoid conflicts with existing conditions. Where underground structures exist, every effort shall be made to properly protect and preserve them. Where such structures are damaged in the prosecution of the work, they shall be immediately repaired in conformance with best standard practice or according to the specifications of the owner of such underground structures. Where actual conflicts are unavoidable, every effort shall be made to construct the work so as to cause as

little interference as possible with the service rendered by the structure disturbance. Repair of such structures shall be made at no cost to the Owner.

## 3.3 EXCAVATION AND PREPARATION OF TRENCH

A. The Trench shall be dug so that the pipe can be laid to the alignment and depth required, and it shall be excavated only so far in advance of pipe laying as permitted by the Engineer. The trench shall be so braced and drained that the workmen may work therein safely and efficiently. It is essential that the discharge of the trench dewatering pumps be conducted to natural drainage channels, drains, or sewers.

B. The location of sewers, conduits and structures, as shown on the plans, have been selected to provide the service intended. The Owner reserves the right to make minor variations in the location of these items during construction, and no extra payment will be allowed the Contractor for such shifts in alignment.

C. The width of the trench shall be ample to permit the pipe to be laid and jointed properly, and the backfill to be placed and compacted as specified. Trenches shall be of such extra width, when required, as will permit the convenient placing of timber supports, sheeting and bracing, and handling of specials.

D. Bell holes shall be provided at each joint to permit the jointing to be made properly.

E. The trench shall be excavated to the depth required so as to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground at every point between bell holes, except that it will be permissible to disturb and otherwise damage the finished surface over a maximum length of 18 inches near the middle of each length of ductile iron pipe by the withdrawal of pipe slings or other lifting tackle. Any part of the bottom of the trench excavated below the specified grade shall be corrected with approved material thoroughly compacted as directed by the Engineer. The finished subgrade shall be prepared accurately by means of hand tools.

F. Where the bottom of the trench at subgrade is found to be clay or unstable or to include ashes, cinders, all types of refuse, vegetable or other organic material, or large pieces or fragments of inorganic material which, in the judgment of the Engineer, shall be removed, such unsuitable material shall be removed to the width and depth ordered by the Engineer. Before the pipe is laid, the subgrade shall be made by backfilling with an approved material in three (3) inch uncompacted layers. The layers shall be thoroughly tamped as directed by the Engineer so as to provide a uniform and continuous bearing and support for the pipe at every point between bell holes, except that it will be permissible to disturb and otherwise damage the finished surface over a maximum length of pipe by the withdrawal of pipe slings or other lifting tackle. The finished subgrade shall be prepared accurately by means of hand tools.

G. Where the bottom of the trench at subgrade is found to consist of material which is unstable to such a degree that, in the opinion of the Engineer, it cannot be removed and replaced with an approved material thoroughly compacted in place to support the pipe properly, a foundation for the pipe consisting of piling, timbers, or other materials shall be constructed in accordance with plans prepared by the Engineer.

H. All surface materials which, in the opinion of the Engineer, are suitable for reuse in restoring the surface shall be kept separate from the general excavation material as directed by the Engineer.

I. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Hydrants under pressure, valve pit covers, valve boxes, cut stop boxes, fire and police call boxes, or other utility controls shall be left unobstructed and accessible until the work is completed. Cutters shall be kept clear or other satisfactory provisions made for street drainage, and natural watercourses shall not be obstructed.

J. Trench width below the pipe crown shall not exceed 2.0 feet plus the internal diameter of the pipe.

## 3.4 SHEETING AND BRACING

A. Open cut trenches shall be sheeted and braced as required by OSHA and any governing state laws and municipal ordinances, and as may be necessary to protect life, property, or the work. When close sheeting is required, it shall be so driven as to prevent adjacent soil from entering the trench either below or through such sheeting. Where sheeting and bracing are used, the trench width shall be increased accordingly.

B. Sheeting and bracing which have been ordered left in place must be removed for a distance of three (3) feet below the established street grade or the existing surface of the street, whichever is lower. Trench bracing, except that which must be left in place, may be removed when the backfilling has reached the respective levels of such bracing. Sheeting, except that which has been left in place, may be removed after the backfilling has been completed or has been brought up to such an elevation as to permit its safe removal.

## 3.5 WATER IN EXCAVATION

A. Water shall not be allowed in the trenches while the pipes are being laid. The use of a modern and efficient method of dewatering will be required. This may be done by an adequate well point system, except that other means of dewatering will be permitted only by the approval of the Engineer. The Contractor shall not open up more trench than the available pumping facilities are able to dewater. The Contractor shall assume responsibility of disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working. In no case shall the pipe lines be used as drains for such water, and the ends of the pipe shall be kept properly and adequately blocked during construction by the use of approved stoppers and not be improvised equipment. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing matters into the pipe lines; and on completion of the work, any such material which may have entered the pipe lines must be cleaned out so that the entire system will be left clean and unobstructed.

## 3.6 LAYING GRAVITY SEWER PIPE

A. The pipe laying shall proceed up grade, beginning at the lower end of the sewer with bell ends up grade. Extreme care shall be observed in keeping pipe in exact alignment and elevation. In no case shall the pipe be walked on either before or after the joints have been made. All openings, such as stubs and other services, along the line of sewer shall be securely closed by means of an approved cap that fits into the bell of the pipe. This cap shall be jointed in such a manner that it may be removed, at some future time, without injury to the pipe itself.

B. During suspension of work at any time for any reason a suitable and approved stopper shall be placed in the end of the pipe last laid to prevent any foreign material from entering the line. Immediately after the pipe has been jointed and inspected sufficient backfill shall be performed to adequately protect the pipe from injury and movement. Backfilling shall conform to applicable sections of these specifications. Upon discovery at any time of any defective pipe which may have been laid, it shall be taken up and replaced with a perfect pipe at no additional cost to the Owner. On completion, sewer lines shall show a full circle of light when lamped between manholes.

C. The use of laser beams shall be the only acceptable method of controlling pipe alignment and grade.

## 3.7 HANDLING PIPE

A. The pipe shall be loaded and unloaded by lifting hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handling on skidways shall not be skidded or rolled against pipe already on the ground.

## 3.8 BACKFILLING

A. All backfill material shall be free from cinders, ashes, refuse, vegetable or organic material, boulders, rocks or stones, or other material which, in the opinion of the Engineer, is unsuitable.

B. When the type of backfill material is not indicated on the drawings, or specified, backfill may be made with excavated material, provided that such material consists of limerock, sand, gravel, or other materials which, in the opinion of the Engineer, are suitable for backfilling. Compacted backfill shall be placed in not more than six (6) inch layers and compacted to not less than 90% standard density as defined in AASHO T99.

C. The trench shall be backfilled by hand or by approved mechanical methods, from the centerline of the pipe, fittings, and appurtenances, or the top of granular material to a depth of one (1) foot above the top of the pipe. Special care shall be exercised in placing this portion of the backfill so as to avoid injuring or moving the pipe.

D. From one (1) foot above the pipe to the grade shown on the drawings or specified herein, the trench shall be backfilled by hand or by approved mechanical methods.

E. Where the excavation is made through permanent pavement, curbs, driveways, or sidewalks, or where such structures are undercut by the excavation, the entire backfill to the subgrade of the structure shall be made with sand. Walks and driveways, consisting of broken stone, gravel, slag, or cinders shall not be considered as being of a permanent construction. Backfilling under paved areas shall be compacted to at least 95% standard density as defined in AASHO T-99. Backfilling shall meet all requirements of Paragraph 8 Section PL.

## 3.9 SEWER MANHOLES

A. General: Manholes shall be constructed at locations shown on plans or as directed by the Engineer. Manholes shall be of the size and type as indicated on the plans.

B. Excavation shall be made in conformance with the applicable sections of these specifications.

C. Concrete used in manhole construction shall be as specified in SECTION 03 300 of these specifications.

D. The brick work of the manholes shall be constructed of standard common building brick as specified in Materials for this section of these specifications. Brick shall be laid in a full bed and joints of mortar. Manholes shall be plastered as shown on drawings, to leave a smooth dense finish completely water tight. Brick work shall be built as a through course. Walls shall be bonded with whole headers every sixth course. Beds and vertical joints shall be as close as practical and vertical joints shall radiate from the center and shall be flushed full. All inside joints shall be struck. Brick shall be shoved in place (not laid) in a full bed of mortar. This requirement is important, and will be rigidly enforced. Excess mortar shall not be cut off in a manner that will tend to pull mortar from the contiguous brick surface.

E. Where shown on plans or ordered by the Engineer drop inlets to the manholes shall be constructed as detailed on the plans. Fittings shall be carefully jointed and the whole installation surrounded by concrete as shown.

F. Inverts shall be formed of mortar and brick to provide a smooth flowing channel of the exact shape of the sewer to which it connects. Where more than one pipe enters manhole the various channels shall be formed to provide an invert for each such pipe. Changes in direction of the sewer and entering branch or branches shall have a true curve of as large a radius as the size of the manhole will permit.

G. Where shown on the plans or ordered by the Engineer, new line shall be connected into existing manholes. For this purpose a portion of the manhole wall masonry and floor slab shall be removed. The floor shall be reformed and finished to provide flow channels as specified for new manholes and brick masonry replaced to give watertight joints with the new pipe and sidewall.

H. Precast manhole bottom section will be permitted or manhole bottoms may be poured-in-place concrete as shown on the plans. Precast manhole bottoms shall have a minimum thickness of 5 inches and manhole wall sections, a minimum thickness of 5 inches. Thickness of all precast sections shall be adequate to prevent flotation.

I. If a poured-in-place bottom is used, the bottom riser shall be firmly imbedded in the concrete base before the concrete has fully cured. Manhole risers shall conform to ASTM Designation C478 4000 PSI concrete. Joint sealer shall be "Ram-Nek" premolded plastic, as manufactured by K. T. Snyder Co., Houston, Texas, or approved equal. Top cone section shall provide a minimum of eight (8) inch seat for brick adjustment.

J. Where manholes are located on a ditch side slope, the manhole cover shall be placed at such an angle as to be parallel with the ditch side slope. Final elevation of manhole tops shall be as indicated on the plans or as otherwise specified above.

## 3.10 TESTS

A. All work constructed under this contract shall be subject to visual inspection for faults, defects or omissions.

B. Gravity Sewers: After completion, the gravity sewers, or sections thereof, will be tested for infiltration and/or exfiltration. All joints shall be tight and visible for leakage in the joints or leakage in excess of that specified herein shall be repaired at the Contractor's expense by any means found necessary. Tests shall be made in accordance with the following applicable test procedures.

1. Infiltration Test: To test for infiltration, the Contractor shall install and maintain a V-notch sharp crested weir in a wood frame tightly secured at the low end of each sewer lateral and at locations on the main sewers directed by the Engineer. Maximum allowable infiltration shall be 200 gallons per mile per inch of diameter of sewer per 24 hour day at any time. When infiltration is demonstrated to be within allowable limits, the Contractor shall remove such weirs.
2. Exfiltration Test: In areas where ground water is not encountered during sewer construction, the Contractor shall furnish and install all necessary materials, equipment, shall supply water, etc. and run exfiltration tests as hereafter described before the sewer is accepted. The maximum allowable exfiltration shall be 50 gallons per mile per inch of diameter of sewer per 24 hour day at any time. To check the amount of exfiltration, the ends of each section of sewer between the manholes shall be plugged with watertight bulkheads. Inserted in each bulkhead at the top of the sewer pipe shall be a 2 inch pipe, with an elbow, extending 4 feet vertically in the upper manhole pipe to a height of 4 feet of water. Using measured containers, the water shall be poured into the upper 2 inch pipe as needed to maintain a constant head of 4 feet in the upper pipe and a constant level in the lower pipe for a period of thirty minutes, not allowing the lower pipe to overflow. The volume of water added during the thirty-minute period shall not exceed the allowable stated above.2.

C. All tests shall be made by the Contractor in the presence of the Engineer. All expense of the above tests shall be borne by the Contractor and be included in the unit price bid per foot of pipe.

## 3.11 SEPTIC SYSTEM

A. The contractor shall construct the septic system to meet the design specifications per the requirements of the drawings and these specifications and shall conform to all City, State, County, and local laws and regulations.

B. Close out items for the septic system shall include the following:

1. Manual for the pumps installed with the septic system.
2. Operation and maintenance document for the entire septic system.

END OF SECTION 02730

# SECTION 02750 UNDERGROUND IRRIGATION SYSTEMS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Includes But Not Limited To:

1. Furnishing and installing sprinkler system as described in Contract Documents complete with accessories necessary for proper functioning.

### 1.2 SYSTEM DESCRIPTION

A. Design Requirements:

1. Layout of Irrigation Heads:

a. Location of heads shown on Drawings is approximate. Actual placement may vary slightly as is required to achieve full, even coverage without spraying onto buildings, sidewalks, fences, etc.
b. During layout, consult with Landscape Architect to verify proper placement and make recommendations, where revisions are advisable.

### 1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Work and materials shall be in accordance with latest rules and regulations, and other applicable state or local laws. Nothing in Contract Documents is to be construed to permit work not conforming to these codes.

B. Pre-Installation Conference:

1. Meet with Owner and Landscape Architect to discuss and clarify all aspects of job requirements prior to commencing work of this Section.

C. Minor adjustments in system will be permitted to avoid existing fixed obstructions.

### 1.4 SUBMITTALS

A. Record Drawings:

1. Prepare an accurate as-built drawing as installation proceeds to be submitted prior to final inspection, including:

a. Detail and dimension changes made during construction.
b. Significant details and dimensions not shown in original Bidding Documents.

2. Maintain, at job site, one copy of Contract Documents (as defined in Section 2 of the General Conditions) and relevant shop drawings.
3. Clearly, mark each document "PROJECT RECORD COPY" and maintain in good condition for use of the Landscape Architect and Owner.
4. As-built drawing shall be clearly drawn on reproducible mylar.
5. Submit product literature for all sprinklers, automatic control valves, and controller.
6. Final payment for system will not be authorized until accurate and complete submittals are delivered to the Landscape Architect.

B. Instruction Manual:

1. Provide instruction manual, which lists complete instructions for system operation and maintenance.

## 1.5 PRODUCT STORAGE

A. During construction and storage, protect materials from damage and prolonged exposure to sunlight.

## 1.6 WARRANTY

A. Standard one year guarantee stipulated in General Conditions shall include:

1. Completed system including parts and labor.
2. Filling and repairing depressions and replacing plantings due to settlement of irrigation trenches for one year following acceptance of Project.
3. System adjustment to supply proper coverage to areas to receive water.

## 1.7 MAINTENANCE

A. Extra Materials:

1. In addition to installed system, furnish building with following items at close-out:

a. Two sprinkler head bodies of each size and type.
b. Two nozzles for each size and type.
c. Two adjusting keys for each sprinkler head cover type.

## PART 2 - PRODUCTS

### 2.1 PIPE, PIPE FITTINGS, AND CONNECTIONS

A. Pipe shall be continuously and permanently marked with Manufacturer's name, size, schedule, type, and working pressure.

B. Pipe:

1. Pressure Lines: Schedule 40.
2. Lateral Lines: Schedule 40.

C. Fittings:

1. Schedule 40.

D. Sleeves:

1. Schedule 40 size indicated on plan.

### 2.2 SPRINKLER HEADS

A. Conform to requirements show on Drawings as to type, size, radius of throw, pressure, and discharge.

### 2.3 SPRINKLER RISERS

A. Stationary spray pop-up sprinkler and gear driven heads, shrub spray heads, bubbler heads, and stationary spray sprinkler heads shall conform to requirements shown on the Drawings.

### 2.4 AUTOMATIC SPRINKLER SYSTEMS

A. Control valves shall be of size and type indicated on Drawings.

B. Control wire shall be UL listed, color-coded copper conductor direct burial size 14. Tape control wires to bottom of main line every 10 feet. Where control wire leaves main or lateral line, enclose it in Class 200 PVC conduit. Use 3M DBY waterproof wire connectors at splices and locate all splices within valve boxes. Use white or gray color for common wire and other colors for all other wire. Each common wire may serve only one controller.

C. Add one extra control wire from panel to valves for use if a wire fails and mark it in the control box as an extra wire. This wire shall be of a different color than the others.

## 2.5 VALVES

A. Electric Valves:

1. Make and model shown on Drawings.

B. Gate Valves:

1. Bronze construction, angle type, 150-pound class, threaded connections, with cross-type operating handle designed to receive operating key.

C. Automatic Controller:

1. Make and model shown on Drawings.

D. Backflow Preventor:

1. Make and model shown on Drawings.

## 2.6 VALVE ACCESSORIES

A. Valve Boxes:

1. Ametek or Brooks rectangular heavy-duty valve box with locking lid or Landscape Architect approved equal.
2. Do not install more than two valves in a single box.
3. Valve boxes shall be large enough for easy removal or maintenance of valves.

# PART 3 - EXECUTION

## 3.1 PREPARATION

A. Protection:

1. Work of others damaged by this Section during course of its work shall be replaced or repaired by original installer at this Section's expense.

## 3.2 INSTALLATION

A. Trenching and Backfilling:

1. Over-excavate trenches 2 inches and bring back to indicated depth by filling with fine, rock-free, soil or sand.
2. Cover pipe both top and sides with 2 inches of material specified in paragraph above. In no case, shall there be less than 2 inches of rock-free soil or sand surrounding pipe.
3. Do not cover pressure main, sprinkler pipe, or fittings until the Landscape Architect has inspected and approved system.

B. Installation of Plastic Pipe:

1. Install plastic pipe in a manner to provide for expansion and contraction as recommended by Manufacturer.
2. Unless otherwise indicated on Drawings, install main lines and lateral lines connecting rotor pop-up sprinklers with minimum cover of 18 inches based on finished grade. Install remaining lateral lines with a minimum of 12 inches of cover based on finish grade.
3. Install pipe and wires under driveways or parking areas in specified sleeves 18 inches minimum below finish grade or as shown on Drawings.
4. Locate no sprinkler head closer than 12 inches from building foundation. Heads immediately adjacent to mowing strips, walks or curbs shall be one inch below top of mowing strip, walk or curb and have a minimum of one inch clearance between head and mowing strip, walk or curb.
5. Drawings show arrangement of piping. Should local conditions necessitate rearrangement, obtain approval of Landscape Architect before proceeding with work.
6. Cut plastic pipe square. Remove burrs at cut ends prior to installation so unobstructed flow will result.
7. Make solvent weld joints in the following manner –

    a. Clean mating pipe and fitting with clean, dry cloth and apply one coat of P-70 primer to each.
    b. Apply uniform coat of 711 solvent to outside of pipe.
    c. Apply solvent to fitting in similar manner.
    d. Re-apply a light coat of solvent to pipe and quickly insert into fitting.
    e. Give pipe or fitting a quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.
    f. Hold in position for 15 seconds minimum or long enough to secure joint.
    g. Wipe off solvent appearing on outer shoulder of fitting.
    h. Do not use an excessive amount of solvent thereby causing an obstruction to form on inside of pipe.
    i. Allow joints to set at least 24 hours before applying pressure to PVC pipe.

8. Tape threaded connections with teflon tape.
9. Install concrete thrust blocks wherever change of direction occurs in PVC main pressure lines, unless otherwise detailed on Drawings.

C. Control Valves and Controller:

1. Install controller, control wires, and valves in accordance with Manufacturer's recommendations and according to electrical code.
2. Install valves in plastic boxes with reinforced heavy-duty plastic covers. Locate valve box tops at finish grade. Valve boxes shall have snap top lids.
3. Install remote control valves in valve boxes positioned over valve so all parts of valve can be reached for service. Set cover of valve box even with finish grade. Install valve boxes over 9 inches of gravel for drainage and reasonably free of dirt and debris.

D. Sprinkler Heads:

1. Prior to installation of sprinkler heads, open control valves and use full head of water to flush out system.
2. Set sprinkler heads perpendicular to finish grade.
3. Set lawn sprinkler heads adjacent to existing walks, curbs, and other paved areas to grade.

## 3.3 FIELD QUALITY CONTROL

A. Flushing and Testing:

1. Test pressure lines at minimum sustained pressure of 100 psi for 4 hours. Notify Landscape Architect 24 hours prior to test. Do not backfill lines until approved by Landscape Architect.

## 3.4 ADJUSTMENT AND CLEANING

A. Adjust heads to proper grade when turf is sufficiently established to allow walking on it without appreciable harm. Such lowering or raising of heads shall be part of original contract with no additional cost to Owner.

B. Adjust sprinkler heads for proper distribution and trim and so spray does not fall on building.

C. Adjust watering time of valves to provide proper amounts of water to all plants.

## 3.5 DEMONSTRATION

A. After system is installed and approved, instruct owner's representative in complete operation and maintenance.

END OF SECTION 02750

# SECTION 02751 - CEMENT CONCRETE PAVEMENT

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:

1. Driveways and roadways.
2. Parking lots.
3. Curbs and gutters.
4. Walkways.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.

### 1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

### 1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials and aggregates.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.

5. Curing compounds.
6. Joint fillers.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.

## 1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

# PART 2 - PRODUCTS

## 2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves of a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

## 2.2 STEEL REINFORCEMENT

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

B. Reinforcement Bars: ASTM A 615, Grade 60, deformed.

C. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

D. Tie Bars: ASTM A 615, Grade 60, deformed.

E. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

## 2.3 CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Portland Cement: ASTM C 150, Type II.

C. Aggregate: ASTM C 33, uniformly graded, from a single source, per Florida Department of Transportation (FDOT) standard specifications.

D. Water: ASTM C 94.

## 2.4 CURING MATERIALS

A. Water: Potable.

## 2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Pavement-Marking Paint: Latex, water-base emulsion; ready mixed; complying with FS TT-P-1952.

1. Color: Blue for handicapped requirements, yellow for fire lanes, white elsewhere.

C. Glass Beads: AASHTO M 247.

D. Wheel Stops: Precast, air-entrained concrete; 2500-psi minimum compressive strength; approximately 6 inches high, 9 inches wide, and 84 inches long. Provide chamfered corners and drainage slots on underside, and provide holes for dowel-anchoring to substrate.

1. Dowels: Galvanized steel, diameter of 3/4 inch, minimum length 10 inches.

## 2.6 CONCRETE MIXES

A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.

1. Do not use Owner's field quality-control testing agency as the independent testing agency.

C. Proportion mixes to provide concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 3 inches (75 mm).

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

E. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 2.5 to 4.5 percent.

## 2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.

# PART 3 - EXECUTION

## 3.1 PREPARATION

A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

## 3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

## 3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

1. Apply epoxy repair coating to uncoated or damaged surfaces of epoxy-coated reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

## 3.4 JOINTS

A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
3. Provide tie bars at sides of pavement strips where indicated.
4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet , unless otherwise indicated.

2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated, or 10 feet maximum spacing if no spacing is indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

## 3.5 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery, at Project site, or during placement.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.

I. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

J. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

K. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

L. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

M. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total

amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

## 3.6 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.

1. Vehicular Traffic Areas: Burlap Finish. Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Pedestrian Areas: Medium-to-Fine-Textured Broom Finish. Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

## 3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

C. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

## 3.8 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

## 3.9 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect or Engineer.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal.

## 3.10 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes cast into wheel stops. Firmly bond each dowel to wheel stop and to pavement. Extend upper portion of dowel 5 inches into wheel stop and lower portion a minimum of 5 inches into pavement.

## 3.11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Testing Services: Testing shall be performed according to the following requirements:

1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive-strength specimens.
5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
6. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
8. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).

C. Test results shall be reported in writing to Architect or Engineer, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect or Engineer but will not be used as the sole basis for approval or rejection.

E. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect or Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

## 3.12 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

B. Drill test cores where directed by Architect or Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 02751

# SECTION 02800 LANDSCAPE SPECIFICATIONS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

Drawings and general provisions Contract, including General and Supplementary Conditions and Specification Sections, apply this Section.

### 1.2 SUMMARY: THIS SECTION INCLUDES PROVISIONS FOR THE FOLLOWING ITEMS:

A. Trees.

B. Shrubs.

C. Plants.

D. Ground cover.

E. Lawns.

F. Soil Amendments.

G. Maintenance of landscape materials.

### 1.3 QUALITY ASSURANCE

A. Installer qualifications:

1. Engage a **Florida Certified Landscape Contractor** (FCLC) who has completed landscape work similar in material, design, and extent to that indicated for this Project and with a record of successful tree and shrub establishment and conforms to the following:

    a. Landscape Contractor shall maintain FCLC certification under the auspices of the Florida Nurserymen and Growers Association (FNGA);
    b. Landscape Contractor shall schedule a preconstruction meeting with the Landscape Architect and Owner's Representative prior to the commencement of work.
    c. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that tree and shrub planting is in progress. See Submittals 1.7.

## 1.4 SOURCE QUALITY CONTROL

A. Do not make substitutions. If specified landscape material is not obtainable, submit proof of non-availability to Landscape Architect, together with proposal for use of equivalent material.

## 1.5 ANALYSIS AND STANDARDS

A. Package standard products with manufacturers certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

## 1.6 TREES, SHRUBS AND PLANTS

A. Provide trees, shrubs, and plants of quality, size, genus, species, and variety shown and scheduled for landscape work and complying with recommendations and requirements of "Grades and Standards for Nursery Plants," published by Florida Department of Agriculture and Consumer Services, Division of Plant Industries, latest edition. Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practices and free of disease, insects, eggs, larvae, and defects such as knots, sun-scald, injuries, abrasions, or disfigurement.

## 1.7 INSPECTION

A. The Landscape Architect may inspect trees and shrubs either at place of growth or at site before planting, for compliance with requirements for genus, species, variety, size, and quality. Landscape Architect retains the right to further inspect trees and shrubs for size and condition of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during the process of work. Remove rejected trees or shrubs immediately from project site.

## 1.8 SUBMITTALS: SUBMIT THE FOLLOWING IN ACCORDANCE WITH CONDITIONS OF CONTRACT.

A. Schedule of values: Prior to the commencement of the work, the Landscape Contractor shall submit installed unit prices for all: plant materials (mulch included), sodding, and seeding. Landscape Contractor shall also submit a lump sum price for maintenance period following substantial completion through 12 months guarantee period. The schedule of values, including the maintenance period sum, should equal the total contract price for landscape installation.

B. Maintenance schedule: Submit a maintenance schedule for the guarantee period.

C. A copy of current certificate as a certified Landscape Contractor by Florida Nursery Grower Association.

## 1.9 ROUTINE MAINTENANCE SCHEDULE AND INSTRUCTIONS

A. Typewritten instructions providing procedures to be established by Contractor for maintenance of landscape work for warranty period. Submit prior to commencement of work.

B. Written plant and grassing guarantee to cover guarantee warranty period.

## 1.10 DELIVERY, STORAGE AND HANDLING

A. Packaged materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

B. Sod: Time delivery so that sod will be placed within 24 hours after stripping. Protect sod against drying and breaking of rolled strips.

C. Trees and Shrubs: Do not prune prior to delivery unless otherwise approved by the Landscape Architect. Do not bend or bind-tie trees or shrubs in such a manner as to damage bark, break branches, or destroy natural shape. Provide protective covering during delivery. Deliver trees and shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture. Do not remove container-grown stock from containers until planting time.

## 1.11 JOB CONDITIONS

A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before planting.

C. Weather: When weather conditions detrimental to plant growth are encountered or anticipated, notify Landscape Architect before planting.

## 1.12 SEQUENCING AND SCHEDULING

A. Maintenance period: Maintain all trees, shrubs, groundcovers, and grassing during installation of work and through maintenance period. Twelve (12) month maintenance period, on trees, shrubs, and groundcovers to begin at substantial completion acceptance. Maintain seeded and sodded lawns through substantial completion only.

B. Coordination with lawns: Plant trees, shrubs after final grades are established, and prior to planting of lawns, unless otherwise acceptable to Landscape Architect. If

planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

### 1.13 PROJECT WARRANTY

A. Plants and Trees:

1. Warranty trees and shrubs, for a period of twelve months after date of substantial completion, against defects including death and unsatisfactory growth, except for resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Landscape Contractor's control.
2. Remove and replace trees, shrubs, or other plants found to be dead or in unhealthy condition during warranty period. Make replacements during growth season following end of warranty period. Replace trees and shrubs, which are in doubtful condition at end of warranty period, unless, in opinion of Landscape Architect, it is advisable to extend warranty period for a full growing season.
3. Another warranty inspection will be conducted at the end of extended warranty period, if any, to determine acceptance or rejection. Only one replacement (per tree, shrub, or plant) will be required at end of warranty period, except for losses or replacements due to failure to comply with specified requirements.

B. Sod and Seed:

1. Warranty all grass for a period of 12 months after substantial completion against defects, including death and unsatisfactory growth, as determined by the Landscape Architect, except for defects resulting from neglect by the Owner, abuse or damage by others, or the unusual phenomena or incidents, which are beyond the Contractor's control.
2. Remove and replace all grass found to be dead or in an unhealthy condition during warranty period as determined by the Landscape Architect. Make replacements as soon as weather conditions permit.

C. Repair grades, lawn areas, paving, and any other damage resulting from replacement planting operations, at no additional cost to Owner.

## PART 2 - PRODUCTS

### 2.1 DEEP FILL

A. Provide new soil that is fertile, friable, sandy/loam soil, free of clay lumps, brush, weeds, and other litter, and free of roots, stumps, stones, and other extraneous or toxic matter harmful to plant growth.

B. Obtain soil from local sources or from areas having similar soil characteristics to that found at project site. Obtain soil only from naturally, well-drained sites.

## 2.2 SOIL AMENDMENTS

A. Peat Humus: Locally obtained Florida peat, air dried, finely shredded, so completely decomposed, and free of fibers that its biological identity is lost.

## 2.3 MULCH

A. Pine bark mulch with pieces no larger than 3" o.a.

## 2.4 COMMERCIAL FERTILIZER

A. Complete fertilizer of neutral character, with some elements derived from organic sources and containing the following percentages of available plant nutrients:

B. For trees and shrubs, provide fertilizer with not less than 3 percent total nitrogen, 9 percent available phosphoric acid, and 6 percent soluble potash. Apply at manufacturer's recommended rate.

C. For lawns, provide fertilizer with not less than 16 percent total nitrogen, 4 percent available phosphoric acid, and 8 percent soluble potash. Apply at manufacturer's recommended rate.

## 2.5 PLANT MATERIALS

A. Quality: Provide trees, shrubs, and other plants of size, genus, species, and variety shown and scheduled for landscape work and complying with Florida No. 1 quality standard.

## 2.6 GRASS MATERIALS

A. Sod: Provide sand-grown only, strongly rooted sod, not less than 2 years old, free of weeds and undesirable native grasses, and machine cut to pad thickness of 3/4 inch (plus or minus 1/4 inch), excluding top growth and thatch. Provide only sod capable of vigorous growth and development when planted (viable, not dormant).

1. Provide sod of uniform pad sizes with a maximum 5 percent deviation in either length or width. Broken pads or pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10 percent of pad will be rejected.
2. "St. Augustine" sod shall be "Bitter Blue"
3. "Bahia" sod shall be "Argentine."

## 2.7 GROUND COVER

A. Provide plants established and well rooted in removable containers with not less than minimum number and length of runners required by Florida No. 1 standards for the pot size shown or listed.

## PART 3 - EXECUTION

### 3.1 PREPARATION - GENERAL

A. Lay out individual tree and shrub locations and areas for multiple plantings. Outline areas and secure Landscape Architect's acceptance before start of planting work. Make minor adjustments as may be required.

### 3.2 PREPARATION OF PLANTING SOIL FOR TREES AND SHRUBBERY

A. Before mixing, clean existing soil of roots, plants, sods, stones, clay, lumps, and other extraneous materials harmful or toxic to plant growth.

B. Mix specified soil amendments and fertilizers with existing soil at rates specified. Delay mixing of fertilizer if planting will not follow placing of planting soil within a few days.

C. Ground cover planting beds - Provide not less than 1 part loose peat humus to 3 parts of soil by volume. Provide 3 lbs. of bed mix fertilizer, 3-9-6, per 100 sq. ft.

D. Backfill for trees and shrubs - Provide specified materials in quantities not less than 1 part of loose peat humus to 3 parts existing soil by volume. Provide 3 lbs. of bed mix fertilizer per cu. yd. of backfill.

E. For planting ground cover beds, mix planting soil either prior to planting of apply on surface of ground and mix thoroughly before planting.

### 3.3 PREPARATION FOR PLANTING LAWNS

A. Preparation of unchanged grades: Where lawns are to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for lawn planting as follows: Remove existing grass, vegetation, and turf. Spot spray with 'Round-up" or other appropriate herbicide if weeds are still present. Do not turn existing vegetation over into soil being prepared for lawns.

B. Remove high areas and fill depressions. Grade soil to a homogeneous mixture of fine texture, free of lumps, clods, stones, roots, and other extraneous matter.

C. Allow for sod thickness in areas to be sodded.

D. Apply specified commercial fertilizer at rates specified and thoroughly mix into upper 2 inches of topsoil. Delay application of fertilizer if lawn planting will not follow within a few days.

E. Fine grade lawn areas to smooth even surfaces, with loose uniformly fine texture. Roll, rake, and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.

F. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.

G. Restore lawn areas to specified condition, if eroded or otherwise disturbed, after fine grading and prior to planting.

## 3.4 EXCAVATION FOR TREES AND SHRUBS

A. Excavation pits, beds, and trenches with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Loosen hard subsoil in bottom of excavation.

B. Fill excavations for trees and shrubs with water and allow water to percolate out prior to planting.

## 3.5 PLANTING TREES AND SHRUBS

A. Set plant material stock on layer of compacted planting soil mixture, plumb and in center of pit or trench with top of ball at same elevation as adjacent finish landscape grades. When set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.

B. Dish top of backfill to allow for mulching.

C. Mulch pits, trenches, and planted areas. Provide not less than the following thickness of mulch, and work onto top of backfill and finish level with adjacent finish grades.

Provide **3 inches** thickness of mulch. Mulch is to be Pine Bark

D. Prune, thin out, and shape trees and shrubs in accordance with standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by Landscape Architect, do not cut tree leaders, and remove only injured or dead branches from flowering trees, if any. Prune shrubs to retain natural character.

E. Remove and replace excessively pruned or misformed stock resulting from improper pruning.

F. Guy and stake trees immediately after planting, as needed. Contractor's responsibility to maintain trees in an upright and plumb position.

## 3.6 BACKFILL OF PLANTERS

A. Provide new, clean backfill imported from off site for all new planters.

## 3.7 SODDING NEW LAWNS

A. Lay sod within 24 hours from time of stripping.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Avoid damage to subgrade or sod. Anchor sod on slopes with wood pegs to prevent slippage, if needed.

C. Water sod thoroughly with a fine spray immediately after planting.

## 3.8 PLANTING GROUND COVER

A. Triangle space ground cover plants as indicated or scheduled.

B. Dig holes large enough to allow for spreading of roots and backfill with planting soil. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover crowns of plants with wet soils.

C. Mulch areas between ground cover plants; place not less than 3 inches thick.

## 3.9 MAINTENANCE - PLANTINGS

A. Begin maintenance immediately after planting.

B. Maintain trees, shrubs, and other plants until final acceptance warranty and through twelve-month warranty period.

C. Maintain trees, shrubs, and other plants by pruning, cultivating, watering and weeding as required for healthy growth. Restore planting saucers. Tighten and repair stake and guy wire supports and reset trees and shrubs to proper grades of vertical position as required. Spray as required to keep trees and shrubs free of insects and disease. Visually observe conditions, during warranty period, on a biweekly basis and take necessary action to correct any observed problems. Obtain signature of Owner's Representative to verify upon completion of visit.

## 3.10 MAINTENANCE - SOD

A. Maintain seeded and sodded lawns through substantial completion.

B. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

## 3.11 TREE PRUNING

A. Work consists of pruning and fertilizing designated existing trees for health and vigor.

B. Perform tree pruning and cavity work by a licensed tree surgeon in accordance with ANSI Z 133.3. Remove dead wood 1/2" or more in diameter, branches interfering with or hindering the healthy growth of the trees, and diseased branches with a clean cut made flush with the parent trunk. Cut back or remove branches as necessary to give the trees proper shape and balance. In removing large limbs, make the initial cut on the underside at a safe distance from the trunk or lateral, to prevent ripping of bark. Ensure branches and trimmings do not endanger traffic or cause damage to property during removal. Section large branches or limbs that cannot be removed in one piece without endangering traffic or property. Lower sections by ropes. Repair any damage resulting from the Contractor's negligence during pruning. Workmen are not permitted to climb trees with climbing spurs. To promote proper healing, cut off flush stubs or limbs that have resulted from improper cuts or broken as a result of former pruning. Remove girdling roots. Cuts or wounds measuring 1/2" or more in diameter, and exposed wood and scars resulting from previous work or damage, must be cleaned and painted with specified tree wound dressing. Remove decayed wood to expose healthy tissue. Shape cavities to provide drainage; promptly seal exposed cambium layers around cavities with shellac.

C. Deep fertilize with auger with 100's organic 8-8-8 at the rate of two pounds per 1/2" caliper of trunk.

D. Site should be weed free at time of substantial completion. A further inspection will be made at the end of the maintenance period. Site should also be weed free throughout the maintenance period.

## 3.12 CLEANUP AND PROTECTION

A. During landscape work, keep pavements clean and work area in an orderly condition.

## 3.13 TREE AND PLANT PROTECTION

Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

A. Trees which are to remain in the construction area shall be protected from damage throughout the construction process by the Contractor.

B. Protect the tops, trunks and roots of existing trees on project site that are to remain. Existing trees subject to construction damage shall be boxed, fenced, or otherwise protected before any work is started per details in plans. Remove protection only when directed by the Landscape Architect.

C. Do not permit heavy equipment or stockpiles within branch spread. Remove interfering branches without injury to trunks.

D. All roots of trees to remain that are immediately adjacent to extensive excavation shall be exposed by hand digging and hand cut or sawn cleanly, avoiding any stripping of bark.

E. Trees and palms under 6" in diameter at 12" above finished grade which are destroyed or receive excessive damage during construction shall be replaced in kind and size, or the following value will be deducted from monies due the Contractor:

1. $30.00 per cross sectional area in inches at 12" above finish grade per trunk.

## 3.14 BARRIERS

A. Preserve and protect existing trees and plants at the site which are designated to remain, and those adjacent to the site.

B. Consult with Landscape Architect, and remove agreed upon roots and branches which interfere with construction. Employ a licensed tree surgeon to remove any necessary branches.

C. Provide temporary barriers to a minimum height of 4'-0" around each tree at its drip line, or around each group of trees and plants.

D. D. Protect root zones of trees and plants:

1. Do not allow vehicular traffic or parking.
2. Do not store materials or products.
3. Prevent dumping of refuse or chemically injurious materials or liquids.
4. Prevent puddling or continuous running water.

E. Carefully supervise excavating, grading, and filling and subsequent construction operations to prevent damage.

F. Replace or suitably repair trees and plants designated to remain which are damaged or destroyed due to construction operations.

## 3.15 BARRICADE REMOVAL

A. Completely remove barricades, including foundations, when construction has progressed to the point that they are no longer needed, and when approved by Landscape Architect.

B. Clean and repair damage caused by installation. Fill and grade the areas of the site to required elevations and slopes, and clean the area.

## 3.16 INSPECTION AND ACCEPTANCE

A. When landscape work is completed, including maintenance, Landscape Architect will, upon request, make an inspection to determine acceptability.

B. Landscape work may be inspected for acceptance in portions as agreeable to Landscape Architect, provided each portion of work offered for inspection is complete, including maintenance.

C. When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by Landscape Architect and found to be acceptable. Remove rejected plants and materials promptly from project site.

END OF SECTION 02800

# SECTION 03310 - CONCRETE WORK

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Formwork, concrete, and reinforcing steel for building and site cast-in-place concrete work is included as part of this work.
2. Materials for reinforced unit masonry grouting is included as part of this work.
3. Work associated with FDOT Type F curb and gutter, sidewalks and concrete paving is included as part of this work.

### 1.2 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 301 "Specifications for Structural Concrete for Buildings."
2. ACI 318 "Building Code Requirements for Reinforced Concrete."
3. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
4. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction 1991 edition as amended by the 1994 Supplemental Specifications to the 1991 Standard Specifications for Road and Bridge Construction and all standards referenced therein except for references to methods of measurement and basis of payment.

B. Concrete Testing Service: Engage a qualified testing laboratory under the direction of an Engineer registered in the State of Florida to perform material evaluation tests.

C. Materials and installed work may require testing and retesting, as directed by Owner, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

### 1.3 SUBMITTALS

A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, expansion joint, construction joint and control systems, curing compounds, and others as requested by Architect.

B. Mix Design: Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified by ACI 318-95 Chapter 4. Do not begin concrete production until mixes have been reviewed by Architect. Mix designs shall clearly indicate all materials used and shall be adhered to throughout the job. Mix designs shall include maximum limits for field added water.

C. Shop Drawings, Reinforcement: Submit reinforcing steel shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required and openings through concrete structures. Include locations of all construction joints and details of construction joints.

D. Laboratory Test Reports: Submit laboratory test reports for concrete materials. Submit mill analysis and tensile and bend tests for reinforcing steel.

E. Material Certificates: Submit certifications from the manufacturer showing all data required to indicate compliance with the product specification in Part 2 with certification that the materials meet such specifications.

## PART 2 - PRODUCTS

### 2.1 FORM MATERIALS

A. Forms: For straight forms, use steel, wood or other suitable material, free of distortion and defects, of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use flexible spring steel forms, laminated boards or plywood to form radius bends as required. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

B. Unexposed Finish Concrete: Unexposed concrete surfaces which will be in finished structures may be cast against native soil if it meets compaction requirements, or compacted soil.

C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

D. Form Ties: Factory-fabricated, adjustable length, removable or snapoff metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units which will leave no metal closer than 1-1/2 inch to surface. Provide ties which, when removed, will leave holes not larger than 1-inch diameter in concrete.

### 2.2 REINFORCING MATERIALS

A. Reinforcing Bars: Reinforcing steel for cast in place concrete shall be ASTM A615 Grade 60.

B. Welded Wire Fabric: ASTM A185, welded steel wire fabric.

C. Steel Wire: ASTM A82, plain, cold-drawn steel.

D. Supports for Reinforcement: Provide supports for reinforcement, including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unless otherwise acceptable to Architect.

## 2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C150, Type I or ASTM C595, Type IP with no more than 20 percent fly ash by weight.

B. Normal Weight Aggregates: ASTM C33, and as herein specified. Provide aggregates from a single source for exposed concrete.

1. Local aggregates not complying with ASTM C33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the Architect.

C. Water: Potable.

D. Air-Entraining Admixture: ASTM C260.

E. Water-Reducing Admixture: ASTM C494, Type A, and contain not more than 0.1 percent chloride ions.

F. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C494, Type F or Type G and contain not more than 0.1 percent chloride ions.

G. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C494, Type E, and containing not more than 0.1 percent chloride ions.

H. Water-Reducing, Retarding Admixture: ASTM C494, Type D, and contain not more than 0.1 percent chloride ions.

I. Calcium chloride or admixture containing more than 0.1 percent chloride ions are not permitted.

## 2.4 RELATED MATERIALS

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

B. Moisture-Retaining Cover: One of the following, complying with ASTM C171.

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

C. Water-Based Acrylic Membrane Curing Compound: ASTM C 309, Type I, Class B.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "Conhard," Conspec Marketing and Mfg. Co.
b. "Aqua-Cure," Euclid Chemical Co.
c. "Masterseal W," Master Builders, Inc.
d. "Intex," W.R. Meadows, Inc.
e. "Sika Membrane," Sika Corp.

D. Expansion Joints: Bituminous fiber expansion joint material shall conform to ASTM D1752.

E. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type.

F. Preformed Control Joints: Heckman Building Materials or approved equal.

1. Hot-dipped galvanized, 22 gage steel preformed joints.

## 2.5 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified by ACI 318-95 Chapter 4. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.

C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

1. Concrete for building foundations, slabs, beams, walls:

| | |
|---|---|
| Minimum 28-day Ultimate Compressive Strength | 3000 psi |
| Maximum size of Coarse Aggregate | 3/4 in. |
| Slump | 3 to 5 in. (6 to 8 in. after adding high range water reducing admixture) |
| Entrapped Air Content | 3 to 5% (for slab above grade, walls and beams only) |

2. Reinforced masonry grout:
Minimum 28-day Ultimate Compressive Strength: 3,000 psi
Maximum size of Coarse Aggregate: 3/8 in. pea gravel
Slump: 8" to 11"
Entrained Air Content Not required
3. FDOT Type F Curb and Gutter, sidewalks, and concrete slab-on-grade paving: FDOT Class I Concrete in accordance with FDOT Section 345 or Concrete for building foundations, slabs, beams, walls as specified above.

## 2.6 ADMIXTURES

A. Use water-reducing admixture or high-range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.

B. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperature below 50 deg F (10 deg C).

C. Use air-entraining admixture as indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content as indicated.

D. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

E. E. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as indicated.

## 2.7 CONCRETE MIXES

A. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as herein specified.

B. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

# PART 3 - EXECUTION

## 3.1 FORMS

A. Design, erect, support, brace, and maintain formwork to support lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.

B. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

E. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

## 3.2 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement for formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

## 3.3 JOINTS

A. Construction Joints: Construction joints shall consist of a pre-formed horizontal keyway having one third the depth of the slab. All reinforcing perpendicular to the construction joints shall be continuous through the construction joint. Provide isolation joints at 60' o.c. in interior slabs on grade and between slabs and vertical surfaces of concrete walls or concrete masonry walls where shown. Isolation joints shall consist of ½ inch thick bituminous expansion joint material.

## 3.4 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

B. Edge Forms: Set edge forms or bulkheads to required elevations and contours.

## 3.5 PREPARATION OF FORM SURFACES

A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.

B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

C. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

## 3.6 CONCRETE PLACEMENT

A. Preplacement Inspection: Notify Architect 48 hours before placing concrete for inspections of complete formwork installation, reinforcing steel and items to be embedded or cast-in. No concrete shall be poured prior to field approval of the items by the Architect. Moisten wood forms immediately before placing concrete where form coatings are not used.

B. Coordinate the installation of joint materials with placement of forms and reinforcing steel.

C. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.

D. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

E. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined or horizontal construction joints or cold joints.

F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

G. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

H. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

I. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

J. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

K. Maintain reinforcing in proper position during concrete placement operations.

L. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

M. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C), and not more than 80 deg F (27 deg C) at point of placement.

N. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

O. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

P. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

Q. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.

R. Cover reinforcing steel with water soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

S. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.

T. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

## 3.7 FINISHES

A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and

defective areas repaired and patched and fins and other projections exceeding ¼ inch in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaced exposed-to-view. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams, unless otherwise indicated. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive mortar setting beds for tile, and as otherwise indicated. After placing slabs, plane surface to tolerances as approved by the Architect. Slope surfaces uniformly to drains where required. After leveling, roughen surfaces before final set, with stiff brushes, brooms, or rakes.

D. Float Finish: Apply float finish to slab surfaces to receive trowel finish, non-slip broom finish, and other finishes as herein after specified. After screeding, consolidating, and leveling concrete surface, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit hand floating. Check and level surface plane to tolerance of 1/8 inch in 10 feet. Cut down high spots and fill high spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

E. Trowel Finish: Apply trowel finish to slabs to be exposed to view, and slab surfaces to be covered with vinyl composition tile. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand troweling with surface free of trowel marks and uniform in texture and appearance. Grind smooth surface defects which would telegraph through applied floor covering system.

F. Non-slip Broom Finish: Apply non-slip broom finish to mitered end slab surfaces, sidewalks, and exterior concrete slabs, steps and ramps. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route.

## 3.8 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting; keep continuously moist for not less than 7 days.

C. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

D. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

E. Provide moisture curing by the following methods

1. Keep concrete surface continuously wet by covering with water.
2. Continuous water-fog spray.
3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4 inches lap over adjacent absorptive covers.

F. Provide moisture-cover curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

G. Provide curing compound to slabs as follows:

1. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

H. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing compound.

## 3.9 REMOVAL OF FORMS

A. Form material shall be removed within 24 hours after placement of concrete.

## 3.10 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

## 3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

## 3.12 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect

B. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

C. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

D. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

E. Repair concealed formed surfaces, as directed by Architect, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete as directed by Architect.

F. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

G. Repair finished unformed surfaces that contain defects which affect durability of concrete as directed by Architect. Surface defects, as such, include crazing, cracks in excess of 0.01 inch wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

H. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

I. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.

J. Repair defective areas, except random cracks and single holes not exceeding 1-inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

K. Repair isolated random cracks and single holes not over 1-inch diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

L. Repair methods not specified above may be used, subject to acceptance of Architect.

## 3.13 FDOT TYPE F CURB AND GUTTER, SIDEWALKS, AND CONCRETE SLAB ON GRADE PAVING

A. General: Construction of curb and gutter, sidewalks and concrete slab on grade shall conform to the requirements of pertinent FDOT Standard Specifications Sections, as determined by the Engineer, or the other requirements pertaining to cast in place concrete indicated herein

## 3.14 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. The Contractor shall employ a qualified testing laboratory under the direction of an engineer registered in the State of Florida to perform all tests, sampling, transportation, handling documentation, and submittals of all test reports for review by the Architect. The contractor shall bear the expense of all concrete testing and sampling.

B. Sampling and testing for quality control during placement of concrete shall include slump test and compression tests and may include other of the following as directed by the Architect. All samples and tests shall be identified and indexed to include the project identification name and number, date and time of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch, concrete mix identification and batch plant dispatcher's ticket number reference. The absence of any of this information shall be justification for rejection of the concrete or removal of cast-in-place concrete at the discretion of the Architect.

1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
2. Slump: ASTM C143; one test at point of discharge or as directed by the Architect for each 50 cubic yards or each day's pour of concrete other than reinforced masonry grout, and for each 10 cubic yards of reinforced masonry grout; additional tests as directed by Architect.
3. Air Content: ASTM C173 Volumetric method or ASTM C231 pressure method for normal weight concrete; one test for each 50 cubic yards or for each day's pour of each type of air entrained concrete; additional tests as directed by Architect.
4. Concrete Temperature: Test hourly when air temperature is 40 deg F (4 deg C) and below, and when 90 deg F (27 deg C) and above; and each time a set of compression test specimens made or as directed by Architect.
5. Compression Test Specimen: ASTM C31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed by the Architect. Mold and store cylinders for field cured test specimens.
6. Compressive Strength Tests: ASTM C39; one set for each 50 cubic yards or for each day's pour of concrete other than reinforced masonry grout, and for each 10 cubic yards of reinforced masonry grout; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing as required or as directed by the Architect.
7. When frequency of testing will provide less than 3 strength tests for a given type of concrete, conduct testing from at least 3 randomly selected batches or from each batch if fewer than 5 are used.

C. Test results shall be reported in writing to Architect and Contractor on same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix identification, batch plant dispatcher's ticker number reference, compressive breaking strength and type of break for both 7-day tests and 28-day tests.

D. Nondestructive Testing: Impact hammer (Windsor probe or Swiss hammer), sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

E. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION 03310

# SECTION 04810 - UNIT MASONRY ASSEMBLIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Mortar and grout.
3. Reinforcing steel.
4. Masonry joint reinforcement.
5. Embedded flashing.
6. Miscellaneous masonry accessories.
7. Masonry-cell insulation.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.

C. Products installed, but not furnished, under this Section include the following:

1. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."

### 1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

### 1.4 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths ($f'_m$) at 28 days.

B. Determine net-area compressive strength ($f'_m$) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

## 1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Masonry units.

   a. Include material test reports substantiating compliance with requirements.
   b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.
2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

F. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

## 1.6 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

C. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.8 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

B. Do not apply uniform roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and doorframes, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

### 2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

### 2.2 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners, unless otherwise indicated.

B. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi (13.1 MPa).
2. Weight Classification: Normal weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.
5. Fire rated units: For four hour fire rated assembly, unit classifications B-4 (4 hour), C-3 (3-hour), or D-2 (2 hour) are required. If classifications C-3 or D-2 are used, use insulation required as listed below.

## 2.3 CONCRETE AND MASONRY LINTELS

A. General: Provide either concrete or masonry lintels, at Contractor's option, complying with requirements below.

B. Concrete Lintels: Precast units made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by same method used for concrete masonry units.

C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

## 2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Mortar Cement: ASTM C 1329.

D. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4-inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Aggregate for Grout: ASTM C 404.

F. Water: Potable.

## 2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: W1.7 or 0.148-inch (3.8-mm) diameter.
4. Wire Size for Cross Rods: W1.7 or 0.148-inch (3.8-mm) diameter.

5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
6. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Truss type with single pair of side rods.

## 2.6 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.

## 2.7 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

B. Postinstalled Anchors: Provide torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

## 2.8 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual" and Division 7 Section "Sheet Metal Flashing and Trim."

B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

## 2.9 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch (3.6-mm) steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

## 2.10 MASONRY-CELL INSULATION

A. Foam Fill Insulation: Two-component system consisting of amino-plast resin and a catalyst foaming agent surfactant that does not contain polystyrenes, polyisocyanurates, or polyurethanes and does not contain or emit CFC's or HCFC's.

1. Thermal properties in 8" CMU has an 'R' value of 14.2 or equivalent 'R' value at 4.9 per inch.
2. Flame spread not to exceed 25, smoke developed not more than 450 in accordance with ASTM E-84. Fire rating in accordance with ASTM E-119 equal to four (4) hours. Similar to UL Design Nos. UL 901 and UL 905.
3. Basis of Design Product: The masonry cell foam fill insulation is based on the named product. Subject to compliance with requirements, provide either the named product or a comparable product.

    a. Core-Fill 500; Tailored Chemical Products, Inc.

B. Insulation for four hour rated fire wall assembly: The following are acceptable, non-combustible masonry cell fill for this assembly. All voids in masonry wall to be filled. These fills are required if masonry block type C-3 or D-2 are used.

1. Loose, dry, expanded slag.
2. Burned clay or shale made in rotary kiln process.
3. Vermiculite masonry fill insulation. This insulation shall be water repellent.
4. Perlite loose fill insulation. This insulation shall be silicone treated.
5. Core-Fill 500; Tailored Chemical Products, Inc.

## 2.11 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of ½ cup (0.14L) dry measure tetrasodium polyphosphate and ½ cup (0.14 L) dry measure laundry detergent dissolved in 1 gal. (4 L) of water.

## 2.12 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement, mortar cement, and lime.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type S.
3. 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.
4. For interior non-load-bearing partitions, Type O may be used instead of Type N.

C. Aggregate for Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or if not otherwise indicated , of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

## 2.13 SOURCE QUALITY CONTROL

A. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C 140.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION, GENERAL

A. Thickness: Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

D. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.
7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

## 3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches (100-mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

## 3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

## 3.5 MASONRY-CELL INSULATION

A. At the completion of laying masonry walls, foam fill insulation is pumped into each cell cavity through a small hole drilled into the mortar joints around the entire wall area approximately five (5) feet from the floor level. This method is repeated in lifts of ten (10) feet until the wall is filled completely.

## 3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls.
3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.

    a. Reinforcement above is in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

## 3.7 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants," but not less than 3/8 inch (10 mm).

## 3.8 LINTELS

A. Provide concrete or masonry lintels where shown and where openings of more than 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

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

## 3.9 FLASHING

A. General: Install embedded flashing in masonry at ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows, unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At lintels, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.
4. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.

## 3.10 FIELD QUALITY CONTROL

A. Testing Frequency: One set of tests for each 5000 sq. ft. (465 sq. m) of wall area or portion thereof.

B. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

C. Mortar Test (Property Specification): For each mix provided, per ASTM C 780.

## 3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and

adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

## 3.12 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Excess Masonry Waste: Remove excess clean masonry waste and legally dispose of off Owner's property.

END OF SECTION 04810

# SECTION 04815 - GLASS UNIT MASONRY ASSEMBLIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes glass block set in mortar.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include glass block and accessories.

B. Shop Drawings: Show fabrication and installation details for glass unit masonry, including vertical and horizontal coursing, anchors, reinforcement, and expansion strips.

C. Samples for Initial Selection: Manufacturer's actual glass-block units.

### 1.4 QUALITY ASSURANCE

A. Source Limitations for Glass Block: Obtain glass block through one source from a single manufacturer.

B. Source Limitations for Accessory Materials: Obtain each cementitious material, admixture, and accessory component through one source from a single manufacturer.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store glass-block grid materials in unopened cartons in an enclosed, dry location.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

### 1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation of glass unit masonry assemblies only when ambient and material temperatures are 40 deg F (5 deg C) or higher.

1. Maintain temperature in installation areas at 40 deg F (5 deg C) or above for 48 hours after installing.

### 1.7 SEQUENCING AND SCHEDULING

A. Sequence and coordinate completion of glass unit masonry assemblies so sealants can be installed immediately after mortar has attained final set.

## PART 2 - PRODUCTS

### 2.1 GLASS BLOCK

A. Hollow Glass Block: Hollow units made from transparent glass, with manufacturer's standard edge coating.

1. Basis-of-Design Product: The design for hollow glass block is based on Pittsburgh Corning Corporation; Decora LX. Subject to compliance with requirements, provide the named product or a comparable product.
2. Glass Color: Colorless
3. Pattern: Wavy, light-diffusive design on inner faces, and smooth outer faces.
4. Edge-Coating Color: White.
5. Thick-Faced Units: 7-3/4 inches (197 mm) square by 3-7/8 inches (98 mm) thick, actual size, with faces at least 3/4 inch (19 mm) thick.

### 2.2 MORTAR MATERIALS

A. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

B. Aggregate: ASTM C 144, with 100 percent passing No. 8 (2.36-mm) sieve.

1. For joints narrower than 1/4 inch (6 mm), use aggregate graded with 100 percent passing No. 16 (1.18-mm) sieve.
2. White Aggregates: Natural white sand or crushed white stone.

C. Water-Repellent Admixture: Manufacturer's standard dry mixture of stearates, water-reducing agents, and fine aggregates intended to reduce capillarity in mortar.

D. Water: Potable.

## 2.3 GLASS UNIT MASONRY ACCESSORIES

A. Panel Reinforcement: Ladder-type units, butt welded, not lapped and welded; complying with ASTM A 951 in straight lengths of not less than 10 feet (3 m), and as follows:

1. Exterior Walls: Hot-dip galvanized, carbon-steel wire.
2. Wire Size: W1.7 or 0.148-inch (3.8-mm) diameter.
3. Width: 2 inches (50 mm).
4. Spacing of Cross Rods: Not more than 16 inches (407 mm) apart.

B. Panel Anchors: Glass-block manufacturer's standard perforated steel strips, 0.0359 inch (0.9 mm) by 1-3/4 inches (44 mm) wide by 24 inches (600 mm) long, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.

C. Fasteners, General: Unless otherwise indicated, provide Type 304 or Type 316 stainless-steel fasteners at exterior walls and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at interior walls. Select fasteners for type, grade, and class required.

D. Asphalt Emulsion: Cold-applied asphalt emulsion complying with ASTM D 1187 or ASTM D 1227.

E. Plastic-Foam Expansion Strips: Polyethylene foam complying with requirements of glass-block manufacturer; 3/8 inch (9 mm) thick by 3-1/2 inches (89 mm wide).

F. Sealants: Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Division 7 Section "Joint Sealants."

1. Single-component, neutral-curing silicone sealant.

G. Sealant Accessories: Provide sealant accessories, including primers, bond-breaker tape, and cylindrical sealant backing, that comply with applicable requirements in Division 7 Section "Joint Sealants."

## 2.4 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, or antifreeze compounds, unless otherwise indicated.

1. Do not use calcium chloride in mortar.
2. For mortar in exterior panels, use water-repellent admixture according to admixture manufacturer's written instructions.
3. Limit cementitious materials in mortar to portland cement and lime.

B. Mortar for Glass Unit Masonry Assemblies: Comply with ASTM C 270, Proportion Specification for Type S mortar.

1. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer, unless otherwise indicated. Mix mortar to produce

a stiff but workable consistency that is drier than mortar for brick or concrete masonry. Discard mortar when it has reached initial set.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine sills, jambs, and heads surrounding glass unit masonry assemblies for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLING GLASS BLOCK WITH MORTAR

A. Apply a heavy coat of asphalt emulsion to sill and adhere expansion strips to jambs and heads with asphalt emulsion. Allow asphalt emulsion to dry before placing mortar. Trim expansion strips to width required to fit glass block and to full lengths of heads and jambs.

B. Set glass block with completely filled bed and head joints, with no furrowing, accurately spaced and coordinated with other construction. Maintain 1/4-inch (6-mm) exposed joint widths, unless otherwise indicated.

C. Install panel reinforcement in horizontal joints at spacing indicated and continuously from end to end of panels; comply with the following requirements:

1. Vertical Spacing of Panel Reinforcement for Exterior Panels: Every other course but not more than 16 inches (407 mm) o.c., starting with first course above sill.
2. Do not bridge expansion joints with panel reinforcement.
3. Place panel reinforcement in joints immediately above and below all openings within glass unit masonry assemblies.
4. Lap panel reinforcement not less than 6 inches (150 mm) if more than 1 length is necessary.
5. Embed panel reinforcement in mortar bed by placing lower half of mortar bed first, pressing panel reinforcement into place and covering with upper half of mortar bed.

D. Install panel anchors at locations indicated and in same horizontal joints where panel reinforcement occurs. Extend panel anchors at least 12 inches (300 mm) into joints, and bend within expansion joints at edges of panels and across the head. Attach panel anchors as follows:

E. Use rubber mallet to tap units into position. Do not use steel tools, and do not allow units to come into contact with metal accessories and frames.

F. Use plastic spacers in mortar joints to produce uniform joint widths and to prevent mortar from being squeezed out of joints.

G. Keep expansion joints free of mortar.

H. Clean glass unit masonry assemblies as work progresses. Remove mortar fins and smears immediately, using a clean, wet sponge or a scrub brush with stiff fiber bristles. Do not use harsh cleaners, acids, abrasives, steel wool, or wire brushes when removing mortar or cleaning glass unit masonry assemblies.

I. Install sealant at jambs, heads, mullions and other locations indicated. Prepare joints, including installation of primer and bond-breaker tape or cylindrical sealant backing, and apply elastomeric sealants to comply with requirements in Division 7 Section "Joint Sealants."

J. Construction Tolerances: Set glass block to comply with the following tolerances:

1. Variation from Plumb: For lines and surfaces of vertical elements and arris, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch in 40 feet (12 mm in 12 m) or more.
2. Variation from Level: For bed joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (12 mm in 12 m) or more.
3. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/2 inch in 20 feet (12 mm in 6 m) or 3/4 inch in 40 feet (19 mm in 12 m) or more.
4. Variation in Mortar-Joint Thickness: Do not vary from joint thickness indicated by more than plus or minus 1/16 inch (1.5 mm).

## 3.3 CLEANING

A. On surfaces adjacent to glass unit masonry assemblies, remove mortar, sealants, and other residue resulting from glass-block installation, in a manner approved by manufacturers of materials involved.

B. Remove excess sealants with commercial solvents of type recommended by sealant manufacturer. Exercise care not to damage sealant in joints.

C. Perform final cleaning of glass unit masonry assemblies when surface is not exposed to direct sunlight. Start at top of panel using generous amounts of clean water. Remove water with clean, dry, soft cloths; change cloths frequently to eliminate dried mortar particles and aggregate.

END OF SECTION 04815

# SECTION 05500 - METAL FABRICATIONS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Metal bollards.

### 1.3 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

### 1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Provide allowance for trimming and fitting at site.

## PART 2 - PRODUCTS

### 2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

### 2.2 FERROUS METALS

A. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads, galvanized.

## 2.3 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

## 2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

## 2.5 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.

1. Cap bollards with 1/4-inch- (6.4-mm-) thick steel plate - domed.

# PART 3 - EXECUTION

## 3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. 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. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

## 3.2 INSTALLING METAL BOLLARDS

A. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

B. Fill bollards solidly with concrete.

## 3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

# SECTION 06100 - ROUGH CARPENTRY

## 1.0 - GENERAL

**RELATED DOCUMENTS:** Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**SUMMARY:** Types of work in this section include rough carpentry for wood grounds, nailers, blocking and plywood and gypsum sheathing.

Finish carpentry is specified in another section within Division 6.

**SUBMITTALS:**

**WOOD TREATMENT DATA:** Submit chemical treatment manufacturer's instructions for handling, storing, installation and finishing of treated material.

**PRESERVATIVE TREATMENT:** For type specified, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained and conformance with applicable standards.

For water-borne treatment include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.

**DELIVERY AND STORAGE:** Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

**PROJECT CONDITIONS:** Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.

## 2.0 - PRODUCTS

**LUMBER, GENERAL:**

**LUMBER STANDARDS:** Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

**INSPECTION AGENCIES:** Inspection agencies and the abbreviations used to reference with lumber grades and species include the following:

SPA - Southern Pine Association
SPIB - Southern Pine Inspection Bureau.

**GRADE STAMPS:** Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

Provide dressed lumber, S4S, unless otherwise indicated.

Provide lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

**DIMENSION LUMBER:** No. 2 or better Southern Pine or Spruce.

**PLYWOOD**: Plywood required for backing shall be exterior sheathing grade pine or fir plywood.

**SHEATHING:** Roof sheathing shall be exterior grade plywood, DOC PS1; Wall sheathing shall be Oriented Strand Board (O.S.B.), DOC PS2; of thicknesses indicated.

**PROTECTIVE SHEATHING:** Thermo-Ply Redboard structural sheathing as manufactured by Ludlow Coated Products, or equal. (This sheathing is to be installed on the bottom chords of the roof trusses.)

**BUILDING WRAP:** Tyvex Commercial Wrap by DuPont or equal. Tape all seams and roll overlaps with 2" or 3" DuPont Contractor Tape, to provide maximum air leakage reduction at bottom edge; seal wrap with sealant or tape.

**MISCELLANEOUS MATERIALS:**

**FASTENERS AND ANCHORAGES:** Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.

**WOOD TREATMENT BY PRESSURE PROCESS:**

**PRESERVATIVE TREATMENT:** All lumber shall be treated to comply with applicable requirements of AWPA Standards C2 (Lumber) and of AWPB Standards listed below. Mark each treated item with the AWPB Quality Mark Requirements.

Pressure-treat with water-borne preservatives to comply with AWPB LP-2. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 percent. Treat all items.

When cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment and to comply with AWPA M4. Inspect each piece of lumber after drying and discard damaged or defective pieces.

## 3.0 - EXECUTION

**INSTALLATION, GENERAL:** Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.

Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.

Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.

Countersink nail heads on any exposed carpentry work and fill holes.

Use common wire nails, except as otherwise indicated or required. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

**WOOD GROUNDS, NAILERS AND BLOCKING:** Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement. Remove temporary grounds when no longer required.

**WOOD FRAMING, GENERAL:** Provide framing members of sizes and on spacings shown, and comply with recommendations of "Manual for House Framing" of National Forest Products Association (N.F.P.A).

Anchor and nail as shown or required, and to comply with "Recommended Nailing Schedule" of "Manual for House Framing" and "National Design Specifications for Wood Construction" published by N.F.P.A.

**PLYWOOD**: Comply with the recommendations of APA for the installation of plywood. Insure secure installation.

END OF SECTION 06100

# 06176 - METAL-PLATE-CONNECTED WOOD TRUSSES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes wood roof trusses and truss accessories.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for roof sheathing and dimension lumber for supplementary framing and permanent bracing.

### 1.3 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. SPIB - Southern Pine Inspection Bureau.

### 1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: DL=20psf LL=20psf
2. Maximum Deflection Under Design Loads:

a. Roof Trusses: Vertical deflection of 1/240 of span.

3. Wind Design = 110mph per ASCE 7-02.

### 1.5 SUBMITTALS

A. Shop Drawings: Show location, pitch, span, camber, configuration, and spacing for each type of truss required; species, sizes, and stress grades of lumber; splice details; type, size, material, finish, design values, orientation, and location of metal connector plates; and bearing details.

### 1.6 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with TPI quality-control procedures for manufacture of connector plates published in TPI 1.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that involves inspection by SPIB, Timber Products Inspection, TPI, or other independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

C. Source Limitations for Connector Plates: Obtain metal connector plates through one source from a single manufacturer.

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

1. TP1 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 AFPA's "National Design Specifications for Wood Construction" and its "Supplement."

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with TPI recommendations to avoid damage and lateral bending. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

## 1.8 COORDINATION

A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Metal Connector Plates:

a. Alpine Engineered Products, Inc.
b. CompuTrus, Inc.
c. Eagle Metal Products.
d. Jager Industries, Inc.
e. Mitek Industries, Inc.

f. Robbins Engineering, Inc.
g. TEE-LOK Corporation.
h. Truswal Systems Corporation.

## 2.2 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.

B. Grade and Species: Provide dimension lumber of any species for truss chord and web members, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AFPA's "National Design Specifications for Wood Construction" and its "Supplement."

## 2.3 METAL CONNECTOR PLATES

A. General: Fabricate connector plates to comply with TPI 1 from metal complying with requirements indicated below:

B. Hot-Dip Galvanized Steel Sheet: ASTM A 653/A 653M, G60 coating designation; Designation SS, Grade 33, and not less than 0.036 inch thick.

C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, 80Z coating designation; ASTM A 570/A 570M, Structural Steel (SS), Grade 33, and not less than 0.047 inch thick.

D. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 coating designation; Structural Steel (SS), Grade 33, and not less than 0.036 inch thick.

## 2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1..

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

## 2.5 METAL FRAMING ANCHORS

A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated on drawings.

## 2.6 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. Before installing, splice trusses delivered to Project site in more than one piece.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses 24 inches o.c.; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal framing anchors. Install fasteners through each fastener hole in metal framing anchor according to manufacturer's fastening schedules and written instructions.

H. Securely connect each truss ply required for forming built-up girder trusses.

1. Anchor trusses to girder trusses as indicated.

I. 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.

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

K. Do not cut or remove truss members.

L. Replace wood trusses that are damaged or do not meet requirements.

1. Do not alter trusses in field.

END OF SECTION 06176

## SECTION 06200 - FINISH CARPENTRY

### 1.0 - GENERAL

**RELATED DOCUMENTS:** Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**NOTE:** The Owner will have a separate Contract for furnishing and installing the products in this Section. The General Contractor shall cooperate with those subcontractors and coordinate their efforts as required.

**DESCRIPTION OF WORK:**

**DEFINITION:** Finish carpentry includes carpentry work which is exposed to view, is non-structural, and which is not specified as part of other sections. Types of finish carpentry work in this section include:

Laminate clad cabinets and their hardware.

Cabinet countertops.

Wood handrail.

**RELATED SECTIONS:** The following sections contain requirements that relate to this section:

Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work that is not exposed to view.

Division 8 Section "Flush Wood Doors" for wood doors to be hung under "Finish Carpentry".

Division 8 Section "Finish Hardware" for other than cabinets.

**SUBMITTALS:**

**PRODUCT DATA:** Submit for each type product and process specified and included in cabinet/counter fabrication, finishing and installation.

**SHOP DRAWINGS:** Submit shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

**SAMPLES FOR INITIAL SELECTION PURPOSES:** Submit in form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, patterns or clearness available for each type of material indicated.

Plastic laminate.

**PRODUCT CERTIFICATES:** Submit certificates signed by woodwork manufacturer certifying that products comply with specified requirements.

**QUALIFICATION DATA:** Submit data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architect/Engineers and Owners, and other information specified.

**QUALITY ASSURANCE:**

**MANUFACTURER QUALIFICATIONS:** Firm experienced in successfully producing finish carpentry similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

**INSTALLER QUALIFICATIONS:** Arrange for installation of finish carpentry by a firm that can demonstrate successful experience in installed architectural woodwork items similar in type and quality to those required for this Project.

**AWI QUALITY STANDARD:** Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) Custom Grade.

**PRODUCT DELIVERY, STORAGE AND HANDLING:** Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate materials have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

**PROJECT CONDITIONS:**

**CONDITIONING:** Installer shall advise Contractor of temperature and humidity requirements for finish carpentry installation areas. Do not install finish carpentry until required temperature and relative humidity conditions have been stabilize and will be maintained in installation areas.

Maintain temperature and humidity in installation area as required to maintain moisture content of installed finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of finish carpentry shall determine optimum moisture content and required temperature and humidity conditions.

**FIELD MEASUREMENTS:** Where finish carpentry is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of Work.

## 2.0 - PRODUCTS

*See NOTE regarding LSI Corporation at the end of this section.*

**HIGH PRESSURE DECORATIVE LAMINATE MANUFACTURERS:** Subject to compliance with requirements, provide high pressure decorative laminates of one of the following or pre-approved equal:

Formica Corp.
Micarta Div., Westinghouse Electric Corp.
Nevamar Corp.
Ralph Wilson Plastics Co.

**MATERIALS:**

**GENERAL:** Provide materials that comply with requirements of the AWI woodworking standard for each type of woodwork and quality grade indicated and, where the following products are part of woodwork, with requirements of the referenced product standards, that apply to product characteristics indicated:

**HARDBOARD:** ANSI/AHA A135.4

**HIGH PRESSURE LAMINATE:** NEMA LD 3.

**PARTICLEBOARD:** ANSI A208.1, Grade M-2.

**SOFTWOOD PLYWOOD:** PS 1. (Use exterior-type for all sink tops.)

**FORMALDEHYDE EMISSION LEVELS:** Comply with formaldehyde emission requirements of each voluntary standard referenced below:

Particleboard: NPA 8.

Hardwood Plywood: HPMA FE.

**THERMOSET DECORATIVE OVERLAY:** Particleboard complying with ANSI A208.1, Grade M-2 with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

**LAMINATE CLAD CABINETS**:

**QUALITY STANDARD:** Comply with AWI Section 400 and its Division 400B "Laminate Clad Cabinets" Custom Grade.

**LAMINATE CLADDING:** High pressure decorative laminate complying with the following requirements:

**BASIS OF DESIGN PRODUCT:** Formica; subject to compliance with requirements, provide either the named product or a comparable product.

**COLORS, PATTERNS AND FINISHES:** Provide materials and products that result in colors and textures of exposed laminate surfaces per selections made by Architect/ Engineer from laminate manufacturer's full range of standard colors and finishes.

**LAMINATE GRADE FOR EXPOSED SURFACES:** Provide laminate cladding complying with the following requirements for type of surface and grade.

**HORIZONTAL SURFACES OTHER THAN TOPS:** GP-50 (0.050-inch nominal thickness).

**VERTICAL SURFACES:** GP-50 (0.050-inch nominal thickness).

**EDGES:** GP-50 (0.050-inch nominal thickness).

**DUST PANELS:** Provide dust panels of 1/4 inch plywood or tempered hardboard above compartments and drawers except where located directly under tops.

**CABINET HARDWARE AND ACCESSORY MATERIALS:**

**GENERAL:** Provide cabinet hardware and accessory materials associated with finish carpentry cabinets.

**CABINET HARDWARE AND ACCESSORIES:**

Each door shall have:

| | |
|---|---|
| 1 pair hinges | Equal to 170° opening, self-closing, as manufactured by Blum Clip Hinge; nickel-plated with catch; provide backing plate as required for full overlay door |
| 1 pull | Equal to Häfele 115.61.601. |

Each drawer shall have:

| | |
|---|---|
| 1 pull | Equal to Häfele 115.61.601. |
| 1 set slides | Equal to KV #1805 Self-Close, Euro-Style. |
| 1 lock (where required) | Equal to Häfele 232.10.602. |
| Adjustable shelf hardware | 1/4-inch regular type with nickel-plated bracket; equal to Häfele 282.11.765. |
| Louver | 6" x 12" plastic ventilation grille, see drawings. |
| Keyboard | Equal to Häfele #639.96.305 fully articulated arm with tray #639.86.310, and mouse pad swivel #632.51.300. |

**CABINET COUNTERTOPS:**

**QUALITY STANDARD:** Comply with AWI Section 400 and its Division 400C.

**TYPE OF TOP:** High pressure decorative laminate complying with the following:

Grade: Custom.

**LAMINATE CLADDING FOR HORIZONTAL SURFACE:** High pressure decorative laminate as follows:

**COLORS, PATTERNS AND FINISHES:** Provide materials and products that result in colors and textures of exposed laminate surfaces per selections made by Architect/ Engineer from manufacturer's full range of standard colors and finishes.

**GRADE:** GP-50 (0.050-inch nominal thickness).

**EDGE TREATMENT:** Same as laminate cladding on horizontal surfaces.

**FASTENERS AND ANCHORS:**

**SCREWS:** Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.

**NAILS:** Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

**ANCHORS:** Select material, type, size, and finish required by each substrate for secure anchorage.

**FACTORY FINISHING OF CABINETS:**

**QUALITY STANDARD:** Comply with AWI Section 1500 unless otherwise indicated.

**GENERAL:** The entire finish cabinets is specified in this section, regardless of whether factory applied or applied after installation.

**FACTORY FINISHING:** To the greatest extent possible, finish architectural woodwork at factory. Defer only final touch-up, cleaning, and polishing until after installation.

**GENERAL:** The primary and prefinishing of finish carpentry required to be performed at factory is specified in this section. Refer to Division 9 Section "Painting" for final finishing of installed woodwork and for material and application requirements of prime coats for woodwork not specified to receive final finish in this section.

**PREPARATIONS FOR FINISHING:** Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of cabinets, as applicable to each unit of work.

Complete fabrication, including assembly, finishing, and hardware application, before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

***NOTE:*** *Notwithstanding the preceding information, the following product line of LSI Corporation of America, Inc. shall be acceptable. L45 Design Series, with the following features; door and cabinet body edging to match door/body laminate; brushed chrome wire pulls; heavy duty concealed hinges.*

**HANDRAIL:**

**WOOD SPECIES AND CUT FOR TRANSPARENT FINISH**: Clear red oak, rift sawn.

**QUALITY STANDARD**: Comply with AWI Section 800.

**GRADE: Premium.**

## 3.0 - EXECUTION

**PREPARATION:** Condition wood materials to average prevailing humidity conditions in installation areas before installing.

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

Before installing finish carpentry, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

**INSTALLATION:**

**QUALITY STANDARD:** Install woodwork to comply with AWI Section 1700 for same grade specified for type of woodwork involved.

Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.

Install the work plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 8'-0" for plumb and level countertops; and with 1/16 inch maximum offset in flush adjoining 1/8 inch maximum offsets in revealed adjoining surfaces.

Install cabinets without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

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

Install trim with minimum number of joints possible, using full-length pieces (from maximum lengths of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end-to-end joints.

Anchor finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nails for exposed nailings, countersunk and filled flush with finished surface, and matching final finish where possible. Anchor tops securely to base units and other support systems as indicated or required. Wood handrail to be anchored to partitions as detailed on the Drawings.

**APPLICATION OF SPECIALTIES:** Install specialty items specified in Division 10, unless specific mention is made therein for installation by another trade. Install in accord with manufacturers' recommendations and in a neat manner that will hold the item securely in place.

**ADJUSTMENT, CLEANING AND FINISHING:** Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

Clean finish carpentry work on exposed and semi-exposed surfaces. Tough-up shop-applied finishes to restore damaged or soiled areas.

Clean, lubricate, and adjust hardware.

Refer to Division 9 section "Painting" for final finishing of installed finish trim.

**PROTECTION:** Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensures that woodwork is being without damage or deterioration at time of Substantial Completion.

END OF SECTION 06200

## SECTION 07200 - BUILDING INSULATION

### 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**DESCRIPTION OF WORK**: Extent of building insulation work is shown on drawings and indicated by provisions of this section and the following:

Building insulation in batt form.

**DEFINITION**:

**THERMAL RESISTIVITY**: The thermal resistivity of insulation products designated by "r-values" represents the reciprocal of thermal conductivity (k-values).

**SUBMITTALS**: Submit product data for each type of insulation product specified.

**DELIVERY, STORAGE, AND HANDLING**: Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

### 2.0 PRODUCTS

**INSULATING MATERIALS**:

**GENERAL**: Provide insulating materials that comply with requirements and with referenced standards.

**FACED MINERAL FIBER BLANKET/BATT INSULATION**: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type III, Class A, kraft-faced blankets, with fibers manufactured from glass. At exterior wall, provide nominal 5-1/2" thick batts with minimum R = 21. At attic, provide nominal 10" thick blankets with minimum R = 30. Nominal 3 ½" thick blankets with minimum R-11.

**BASIS OF DESIGN PRODUCT:** Johns Manville Kraft-Faced; subject to compliance with requirements, provide either the named product or a comparable product.

### 3.0 EXECUTION

**EXAMINATION**: Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

**PREPARATION**: Clean substrates of substances harmful to insulations.

**INSTALLATION, GENERAL**: Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.

Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that are not part of the contract and that interfere with placement.
Install the faced-side of the insulation blanket towards the exterior (warm side) of the wall.

**PROTECTION**: Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07200

## SECTION 07311 - ASPHALT SHINGLES

### 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**SUMMARY**: This Section includes asphalt shingles for steep roofs.

**RELATED SECTIONS**: The following Sections contain requirements that relate to this Section:

Division 6 Section "Rough Carpentry" for wood sheathing and framing.

**SUBMITTALS**:

**GENERAL**: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

Product data for each type of product specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.

Samples for initial selection in the form of manufacturer's sample finishes showing the full range of colors and profiles available for each type of asphalt shingle indicated.

**DELIVERY, STORAGE, AND HANDLING**: Deliver materials to Project site in manufacturer's unopened bundles or containers with labels intact.

Handle and store materials at Project site to prevent water damage, staining, or other physical damage. Store roll goods on end. Comply with manufacturer's recommendations for job-site storage, handling, and protection.

**PROJECT CONDITIONS**:

**WEATHER LIMITATIONS**: Proceed with installing asphalt shingles only when existing and forecasted weather conditions will permit work to be performed according to manufacturers' recommendations and warranty requirements, and when substrate is completely dry.

**WARRANTY**:

**GENERAL WARRANTY**: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

**SPECIAL WARRANTY**: Submit a written warranty signed by manufacturer agreeing to repair or replace asphalt shingles that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, deformation or deterioration of asphalt shingles beyond normal weathering.

**WARRANTY PERIOD**: Manufacturer's standard but not less than 25 years after date of Substantial Completion.

**EXTRA MATERIALS**: Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

Furnish 1 square (9.29 sq. m) coverage of asphalt shingles, identical to those to be installed, in unbroken bundles.

## 2.0 PRODUCTS

**ASPHALT SHINGLES**: Basis of Design Product: GAF Timberline 30 (T-30) Architecture Shingle; subject to compliance with requirements, provide either the named product or a comparable product.

Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for asphalt shingles of type indicated.

**METAL TRIM AND FLASHING**:

**SHEET METAL MATERIALS**: Furnish the following sheet metal materials:

**STAINLESS STEEL**: ASTM A 167, Type 304, with No. 2B or 2D finish, minimum 0.015 inch (0.4 mm) thick, unless otherwise indicated.

**METAL DRIP EDGE**: Brake-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. Furnish the following material in lengths of 8 or 10 feet (2.5 to 3 m).

**MATERIAL**: Aluminum sheets, prefinished, color to be selected by Architect.

**METAL FLASHING**: Job-cut to sizes and configurations required.

**STEP FLASHINGS:** Fabricate with a head lap of 2-inches and a minimum extension of 4-inches over the underlying asphalt shingle and up the vertical surface.

**OPEN VALLEY FLASHINGS**: Fabricate in lengths not exceeding 10 feet with 1-inch high inverted-V-profile at center of valley and equal flange widths of 10-inches minimum.

**MATERIAL**: Stainless steel.

**VENT PIPE FLASHING**: Lead conforming to ASTM B 749, Type L51121, at least 1/16 inch (1.6 mm) thick, unless otherwise indicated. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof extending at least 4 inches (100 mm) from pipe onto roof.

**ACCESSORIES**:

**FELT UNDERLAYMENT**: Type I, 36-inch- (914-mm-) wide, asphalt-saturated organic felt, complying with ASTM D 226 (No. 15) or ASTM D 4869.

**RIDGE VENT**: Basis of Design Product: Cobra Rigid Vent II-Black; subject to compliance with requirements, provide either the named product or comparable product, designed to be installed under asphalt shingles at ridge.

**ASPHALT PLASTIC CEMENT**: Nonasbestos fibrated asphalt cement, complying with ASTM D 4586.

**ROLL-ROOFING LAP CEMENT**: Nonasbestos asphalt lap cement, complying with ASTM D 3019, Type III.

**NAILS**: Aluminum or hot-dip galvanized steel, 0.120-inch- (3-mm-) diameter barbed shank, sharp-pointed, conventional roofing nails with a minimum 3/8-inch- (9.5-mm-) diameter head and of sufficient length to penetrate 3/4 inch (19 mm) into solid decking or at least 1/8 inch (3 mm) through plywood sheathing.

Where nails are in contact with flashing, prevent galvanic action by providing nails made from the same metal as that of the flashing.

**STAPLES**: Minimum 0.0625-inch- (1.6-mm-) thick, zinc-coated, steel roofing staples with minimum crown width of 15/16 inch (23.8 mm), and of sufficient length to penetrate 3/4 inch (19 mm) into deck lumber or through plywood deck.

## 3.0 EXECUTION

**EXAMINATION**: Examine substrate for compliance with requirements for substrates, installation tolerances, and other conditions affecting performance of asphalt shingles. Do not proceed with installation until unsatisfactory conditions have been corrected.

**PREPARATION**: Clean substrates of projections and substances detrimental to application. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with noncorrosive roofing nails.

Coordinate installation with flashings and other adjoining work to ensure proper sequencing. Do not install roofing materials until all vent stacks and other penetrations through roof sheathing have been installed and are securely fastened against movement.

**INSTALLATION**:

**GENERAL**: Comply with manufacturer's instructions and recommendations but not less than those recommended by ARMA's "Residential Asphalt Roofing Manual" or "The NRCA Steep Roofing Manual."

Fasten asphalt shingles to roof sheathing with either roofing staples, applied pneumatically, or nails.

**FELT UNDERLAYMENT**: Apply 1 layer of felt underlayment horizontally over entire surface to receive asphalt shingles, lapping succeeding courses a minimum of 2 inches (50 mm), end laps a minimum of 4 inches (100 mm), and hips and valleys a minimum of 6 inches (150 mm). Fasten felt with sufficient number of roofing nails or noncorrosive staples to hold underlayment in place until asphalt shingle installation.

**METAL FLASHED OPEN VALLEY LINING:** Install two layers of 36-inch-wide felt underlayment centered in valley. Stagger end laps between layers at least 72-inches. Lap ends of each layer at least 12-inches in direction to shed water, and seal with asphalt roofing cement. Fasten each layer to roof decking with roofing nails.

Lap roof deck felt underlayment over first layer of valley felt underlayment at least 6-inches.

**FLASHING**: Install metal flashing and trim as indicated and according to details and recommendations of the "Asphalt Roofing" section of "The NRCA Steep Roofing Manual" and ARMA's "Residential Asphalt Roofing Manual."

Install asphalt shingles, beginning at roof's lower edge, with a starter strip of roll roofing or inverted asphalt shingles with tabs removed. Fasten asphalt shingles in the desired weather exposure pattern; use number of fasteners per shingle as recommended by manufacturer. Use vertical and horizontal chalk lines to ensure straight coursing.

Cut and fit asphalt shingles at valleys, ridges, and edges to provide maximum weather protection. Provide same weather exposure at ridges as specified for roof. Lap asphalt shingles at ridges to shed water away from direction of prevailing wind.

Use fasteners at ridges of sufficient length to penetrate sheathing as specified.

**RIDGE VENTS**: Install ridge vents according to manufacturer's instructions.

**ADJUSTING**: Replace any damaged materials installed under this Section with new materials that meet specified requirements.

END OF SECTION 07311

# SECTION 07460 - SIDING

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Fiber-cement siding.
2. Aluminum soffit.
3. Fiber-cement soffit.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for building wrap.
2. Division 7 Section "Joint Sealants."

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Certificates: For each type of siding signed by product manufacturer.

C. Research/Evaluation Reports: For each type of siding required.

### 1.4 QUALITY ASSURANCE

A. Source Limitations for Siding: Obtain each type, texture, and pattern of siding, including related accessories, through one source from a single manufacturer.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials in a dry, well-ventilated, weathertight place.

### 1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with siding installation only if substrate is completely dry and if existing and forecasted weather conditions permit siding to be installed according to manufacturer's written instructions.

### 1.7 SEQUENCING

A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

### 1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace siding that does not comply with requirements or that fails within specified warranty period. Failures include, but are not limited to, cracking, deforming or otherwise deteriorating beyond normal weathering.

1. Warranty Period: 50 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Basis-of-Design Product: The design for each siding is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

a. James Hardie, Inc.; HardiPlank lap siding.

### 2.2 SIDING

A. Fiber-Cement Siding: Siding made from fiber-cement board that does not contain asbestos fibers; complies with ASTM C 1186, Type A, Grade II; is classified as noncombustible when tested according to ASTM E 136; and has a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Available Manufacturers:

a. Cemplank, Inc.; distributed by Georgia-Pacific.
b. CertainTeed Corp.; WeatherBoards.

2. Horizontal Pattern: Boards 6-1/4 to 6-1/2 inches wide in plain style.

a. Texture: Wood grain.

3. Factory Priming: Manufacturer's standard acrylic primer.
4. Fiber Cement trim pieces as indicated on plans, equal to HardiTrim.

## 2.3 SOFFIT

A. Aluminum Soffit: Formed and coated aluminum soffit complying with AAMA 1402.

1. Basis of Design Product: Alcoa Building Products, Inc.

2. Traditional Select; subject to compliance with requirements, provide either the named product or comparable product from manufacturers listed.

a. Gentek Building Products, Inc.
b. Norandex Inc./Reynolds Distribution Company.
c. Reynolds Aluminum

3. Pattern: 6-inch (152-mm) exposure in V-grooved, single board style.
4. Texture: Smooth.
5. Ventilation: Provide perforated soffit.
6. Minimum Nominal Thickness: 0.019 inch (0.5 mm.
7. Finish: Manufacturer's standard primer and baked-on acrylic finish.
8. Colors for Aluminum Soffit: As selected by Architect from manufacturer's full range.

B. Fiber-Cement Soffit: Panels made from fiber-cement board that does not contain asbestos fibers; complies with ASTM C 1186, Type A, Grade II; is classified as noncombustible when tested according to ASTM E 136; and has a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Basis-of-Design Product: James Hardie Inc.; Hardisoffit Panels or a comparable product by one of the following:

2. Available Manufacturers:

a. Same manufacturers listed for fiber-cement siding.

3. Pattern: 24-inch- (610-mm-) wide sheets with smooth texture.
4. Ventilation: Provide unperforated soffit.
5. Factory Priming: Manufacturer's standard acrylic primer.

## 2.4 ACCESSORIES

A. Siding Accessories: Provide starter strips, edge trim, corner cap, and other items as recommended by siding manufacturer for building configuration.

1. Provide accessories made from same material as adjacent siding, unless otherwise indicated.
2. Provide accessories matching color and texture of adjacent siding, unless otherwise indicated.

B. Fasteners:

1. For fastening fiber-cement siding, use hot-dip galvanized fasteners.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

### 3.3 INSTALLATION

A. General: Comply with siding manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply. Center nails in elongated nailing slots without binding siding to allow for thermal movement. Overlap joints to shed water away from direction of prevailing wind.

B. Install aluminum soffit and accessories according to AAMA 1402.

### 3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective siding materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to siding manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 07460

## SECTION 07600 - ALUMINUM GUTTERS AND DOWNSPOUTS

### 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

**SUBMITTALS**:

**GENERAL**: Submit the following in accord with Conditions of Contract and Division 1 Specification Sections.

**PRODUCT DATA**: Manufacturer's technical product data, installation instructions and general recommendations.

Shop drawings showing layout, profiles, methods of joining, and anchorages details.

**PROJECT CONDITIONS**: Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

**GUARANTEE**: Furnish a two-year guarantee against defects in materials and workmanship.

### 2.0 PRODUCTS

**EXTRUDED ALUMINUM GUTTER**: Field-fabricated pre-finished aluminum gutter in continuous lengths as required. Provide leaf guard system along all gutters. Provide gutter outlets as indicated on the plans. Downspouts are to be provided.

**BASIS OF DESIGN PRODUCT**: Englert Inc.; subject to compliance with requirements, provide either the named product or comparable product.

**MISCELLANEOUS MATERIALS AND ACCESSORIES**:

**FASTENERS**: Same metal as gutter or other non-corrosive metal as recommended by gutter manufacturer. Match finish of exposed heads with material being fastened.

**BITUMINOUS COATING**: SSPC - Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

**MASTIC SEALANT**: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

**ELASTOMERIC SEALANT**: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealers."

**EPOXY SEAM SEALER**: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.

**ADHESIVES**: Type recommended by gutter manufacturer for waterproof/ weather-resistant seaming and adhesive application of gutter.

**METAL ACCESSORIES**: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.

**ROOFING CEMENT**: ASTM D 2822, asphaltic.

## 3.0 EXECUTION

**INSTALLATION REQUIREMENTS**:

**GENERAL**: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA "Architectural Sheet Metal Manual." Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.

**CLEANING AND PROTECTION**: Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

**PROTECTION**: Advise Contractor of required procedures for surveillance and protection of gutter work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

END OF SECTION 07600

## SECTION 07900 - JOINT SEALERS

### 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**NOTE**: The Owner will have a separate Contract for furnishing and installing the products in this Section. The General Contractor shall cooperate with those subcontractors and coordinate their efforts as required.

**SUMMARY**: Extent of joint sealers is indicated on drawings and as specified herein, including joint sealers for the following locations:

Exterior joints in vertical surfaces and horizontal surfaces as indicated below.

Perimeter of windows.
Top and sides of door frames.
Perimeters of scuppers/louvers/mechanical equipment at face of wall.
Exterior thresholds.
Other joints as indicated or required.

Interior joints in vertical surfaces and horizontal surfaces as indicated below:

Perimeter joints of exterior openings where indicated or required.
Perimeter joints between interior wall surfaces and frames of interior doors, windows and other openings.
Perimeter joints of toilet fixtures.
Between cabinet and wall or between backsplash and wall at all interior cabinetwork furnished under Division-6 where required.
Other joints as indicated or required.

**RELATED WORK**:

Sealants for glazing purposes are specified in Division-8 Section "Glazing."

Sealing tile joints is specified in Division-9 Section "Tile."

**SYSTEM PERFORMANCES**: Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

**QUALITY ASSURANCE**:

**APPLICATOR QUALIFICATIONS**: Sealant/caulking contractor and job foreman shall have a minimum of 5 years' experience installing sealants and caulking.

**COMPATIBILITY WITH SUBSTRATE**: Applicator shall be responsible for verifying that sealants and caulking used are compatible with joint substrates.

**JOINT TOLERANCE**: Joint width/depth ratios are critical to sealant and caulking performance. Compliance with the manufacturer's limitation is required.

**MANUFACTURER**: The manufacturer of the sealant and caulking used shall have been in the business of manufacturing the specified types of such sealants and caulking for not less than 10 years.

**SUBMITTALS**:

**PRODUCT LITERATURE**: Submit product data sheets and the manufacturer's installation instructions. If two or more different sealants/caulking are to be in physical contact with each other, obtain from each manufacturer confirmation that its product is compatible with the proposed and adjacent products, including any other products which may be used by other sub-contractors. Primer literature shall be included with the submittal document unless the manufacturer's sealant submittal specifically eliminates the need for a primer. If a stain-type primer is required for the sealant selected, such information shall be specifically included on submittal documents calling attention to the need for such staining-type primer and noting the planned precautions to prevent exposed stain residue.

**COLOR SAMPLES**: The manufacturer's standard color charts shall be submitted. Upon request, cured samples of each chosen color shall be submitted for verification of actual color to be installed.

**PRODUCT DELIVERY AND STORAGE**: Delivery shall be in the manufacturer's original unopened container, clearly identifying each product specified, relating it to the product literature submitted. Storage shall be in accord with manufacturer's recommendation, with proper precautions concerning shelf life, temperature, humidity and similar storage factors ensuring the fitness of the material when installed.

**GUARANTEE**: Sealant joints shall be guaranteed against adhesive and cohesive failure of the sealant and against water penetration through the sealed joint for 5 years. Both the contractor and the sealant/caulking contractor shall sign the guarantee. Manufacturer shall warrant the joint sealer materials and shall furnish such warranty to the Architect/Engineer.

## 2.0 PRODUCTS

**MATERIALS, GENERAL**:

**COMPATIBILITY**: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

**COLORS**: Provide color of exposed joint sealers as selected by Architect/Engineer from manufacturer's standard colors.

**BASIS OF DESIGN PRODUCT**: Sherwin-Williams Pro Select; subject to compliance with requirements, provide either the named product or comparable product as listed.

**MATERIALS**:

**EXTERIOR SEALANT**: For masonry and metal to masonry, ASTM C-920-79, Type S, Class 25, Grade NS; TT-S-230(c), Class A, Type II; low modulus, one component or two components, non-sag, polyurethane or polysulfide sealant, Shore A hardness of 15-25, joint movement range of ±50%, minimum elongation of 700%: Pecora - Dynatrol II or Mameco -Vulkem 922 or Sika - Sikaflex 2CNS.

**FLOOR JOINT SEALANT**: ASTM C-920-79, Type S, Class 25, Grade P; TT-S-230(c), Class A, Type I; one component, self-leveling, polyurethane or polysulfide sealant, Shore A hardness greater than 35, joint movement range of ±25%: Pecora - NR 200 or Mameco - Vulkem 245 or Sika - Sikaflex 2CSL.

**SEALANTS IN WET AREAS**: ASTM C-920-79, Type S, Class 25, Grade NS; TT-S-1543(a), Class A; one component, non-sag, mildew resistant, silicone sealant, Shore A hardness of 25-30: Dow Corning - 786 or General Electric - Sanitary Sealant 1700.

**CAULKING**: ASTM C-834-76 one component acrylic latex caulking, minimum 75% recovery per ASTM C-736-82: Pecora - AC-20 or Sonneborn - Sonolac or Tremco - Acrylic-Latex.

**PRIMER**: Primer shall be used in accord with manufacturer's instructions, with all primers being applied prior to the installation of any backer rod or bond breaker tape. Manufacturer shall be consulted for all surfaces not specifically covered in submittal application instructions. If a stain-type primer is used, apply material in a manner that will prevent exposed stain residue related to application procedures.

**BACKER ROD**: Shall be open or closed cell polyethylene or polyurethane as recommended by the sealant manufacturer: ITP or Dow-Ethnafoam or Hercules or pre-approved equal.

**BOND BREAKER TAPE**: An acceptable polyethylene or similar type bond breaker tape shall be used to prevent three-sided adhesion in locations where backer rod cannot be used.

## 3.0 EXECUTION

**INSPECTION**: Inspect substrate surface to ensure that no bond-breaker materials contaminate the surface to which the sealant or caulking is to adhere and to ensure that unsound substrates are repaired. Installation of sealant/caulking shall be evidence of acceptance of the substrate.

Verify joint dimensions prior to installation of the sealant and caulking to ensure that all dimensions are within tolerance established in the manufacturer's literature. Unacceptable variations shall be called to the contractor's attention for resolution prior to installing any material.

**PREPARATION**: Prepare all joints in accord with manufacturer's recommended instructions to ensure maximum adhesion. Prime as required, protecting all adjacent exposed surfaces.

**INSTALLATION**: Install backer rod using only blunt or rounded tools which will ensure a uniform (±1/8") depth without puncturing the material. Backer rod shall be a minimum of 33% oversized for closed cell and minimum of 50% oversized for open cell backer rod, unless otherwise required by the manufacturer.

Protect surrounding surface as required to ensure that no sealant or caulking contaminates these surfaces.

Prepare sealant and caulking as required, then install in accord with manufacturer's recommendations and instructions in order to ensure proper width/depth ratio. Take all necessary steps to prevent three-sided adhesion. Sealant and caulking depth shall be one-half of joint width, with a minimum depth of 1/4", and a maximum of ½", unless otherwise required by the manufacturer.

Both temperature and dampness conditions may restrict application of these sealants and caulking. Comply with manufacturer's instructions.

**CLEANING**: Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

**PROTECTION**: Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that joint sealers are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and installations with repaired areas indistinguishable from original work.

END OF SECTION 07900

## SECTION 08110 - STEEL DOORS AND FRAMES

### 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**DESCRIPTION OF WORK**: Extent of standard steel doors and frames is indicated and scheduled on drawings.

Glazing of doors is specified under "Glass and Glazing" elsewhere in Division-8.

Finish hardware is specified elsewhere in Division-8.

**QUALITY ASSURANCE**: Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.

**FIRE-RATED DOOR ASSEMBLIES**: Where fire-rated door assemblies are indicated or required, provide fire-rated frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows", and have been tested, listed, and labeled in accord with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.

**SUBMITTALS**:

**PRODUCT DATA**: Submit manufacturer's technical product data substantiating that products comply with requirements.

**SHOP DRAWINGS**: Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items. Show oversize doors, their gauges, stiffeners and reinforcement. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings. Hardware templates shall be furnished to the door and frame manufacturer by the finish hardware supplier.

**LABEL CONSTRUCTION CERTIFICATION**: For door assemblies required to be fire-rated, submit manufacturer's certification that each door frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

Exterior doors and frames to meet the hurricane and windload test requirements in accordance with the Florida Building Code and area in compliance with he local authority having jurisdiction. Provide such certification for tested exterior doors and frames

**DELIVERY, STORAGE, AND HANDLING**: Deliver hollow metal work cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory-finished doors.

Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect/Engineer; otherwise, remove and replace damaged items as directed.

Store doors and frames at building site under cover. Place units on minimum 4" high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

## 2.0 PRODUCTS

### METAL DOORS:

**GENERAL**: Furnish flush design hollow metal doors, swing type, 1-3/4" thick, seamless hollow construction, to suit the door opening sizes and the door design, as shown on the drawings and specified herein.

**HOLLOW CORE STEEL DOORS**: Fabricate the doors of two outer cold-rolled, pickled, patent-leveled steel sheets with edges continuously welded and finished flush. Construct the doors with smooth, flush surfaces, without visible joints or seams on exposed faces or stile edges, except around glazed or louvered panel inserts. The face sheet gauge shall be not less than 18-ga. Top and bottom reinforcing channels shall be a minimum of 15-ga. steel, spot-welded within the door. Hinge reinforcing shall be 8-ga.; and closer reinforcing shall be 12-ga. Doors shall be reinforced, stiffened and insulated with impregnated Kraft honeycomb or with urethane core foamed in place and chemically bonded to all interior surfaces of the door. Doors shall be bonderized and finished with one coat of baked-on prime paint. Close top and bottom edges to provide a weather seal as an integral part of the door construction or by the addition of inverted steel channels.

**GLAZING MOLDINGS**: Provide rectangular-shaped steel moldings around glazed openings in doors, with non-removable moldings either an integral part of the door construction or welded thereto, with all welds ground smooth. Assemble removable moldings with butted corners; and secure moldings to the door with countersunk Phillips flathead machine screws, uniformly spaced at 12" o.c. Use stainless steel screws. Form door moldings of 0.0369" thick hot-dipped galvanized steel sheets.

### METAL FRAMES:

**GENERAL**: Provide hollow metal frames for the doors and sidelights as shown on the drawings. Conceal all fastenings, unless otherwise shown. Countersink exposed screws, using Phillips flathead screws. Fabricate frames of 16-ga. steel, corner-welded unit construction, with corners mitered, reinforced, with the welds dressed smooth and flush. Knock-down type frames are not acceptable. Form the frame units of the sizes and profiles shown on the drawings.

**FINISH HARDWARE REINFORCEMENT**: Provide reinforcing for finish hardware as follows:

**HINGES**: Use a steel plate, 3/16" thick x 1-1/2" wide x 6" longer than the hinge, secured by not less than six spot welds.

**STRIKE PLATE CLIPS**: Use a steel plate, 3/16" thick x 1-1/2" wide x 3" long.

**SURFACE-APPLIED CLOSERS**: Use steel sheet, 0.1046" thick (12-ga.), the size and shape as required, secured with not less than six spot welds.

**RUBBER DOOR SILENCERS**: Drill stops to receive three silencers on single door frames. Install plastic plugs to keep the holes clear during construction.

**PLASTER GUARDS**: Provide 26-ga. plaster guards or mortar boxes, welded to the frame, at the backs of all finish hardware cutouts where mortar, grout or other materials might obstruct the hardware operation.

**WALL ANCHORS**: Furnish wall anchors as required to secure the frames to adjacent construction, formed of not less than 0.0516" thick (No. 18 galvanized sheet gauge) steel sheet. Provide a minimum of three anchors per jamb.

**FLOOR ANCHORS**: Provide floor anchors for each jamb and for mullions which extend to the floor. Use clip angle type, formed of not less than 0.0635" thick (16-ga.) steel sheet.

**SPREADER BARS**: Provide two removable spreader bars across the bottoms of the frames, tack-welded to jambs and mullions.

**LABELED DOOR FRAMES**: Labeled door frames scheduled shall be of the same general design and with the same specification requirements, except constructed in accord with the requirements of UL and shall bear their label. Rated doors shall also bear a label indicating "asbestos free."

**PAINT**: Provide one shop coat of rust-inhibitive primer, standard with the frame manufacturer, hand smooth without texture, ripples or blisters.

## 3.0 EXECUTION

**SETTING MASONRY ANCHORAGE DEVICES**: Set anchorage devices opposite each anchor location, in accord with the anchorage device manufacturer's printed instructions. Leave drilled holes rough, not reamed and free from dust and debris. Floor anchors may be set with powder-actuated fasteners instead of masonry anchorage devices and machine screws. Provide 3 anchors each jamb unless otherwise indicated or required.

**PLACING FRAMES**: Place frames prior to the construction of enclosing walls and ceilings. Set accurately in position, plumbed, aligned and braced securely until permanent anchors are set. Make sure the frames are set to permit 180-degree opening of the door. Make sure concealed side is painted and remains so during construction. After the wall construction is completed, remove temporary braces and spreaders, leaving the surfaces smooth and undamaged. Locate three wall anchors per jamb at hinge and strike levels.

**DOOR INSTALLATION**: Fit hollow metal doors accurately in their respective frames, with the following clearances:

| | |
|---|---|
| JAMBS AND HEAD | 1/16" min., 1/8" max. |
| MEETING OF EDGES, PAIRS OF DOORS | 1/8" max. |

BOTTOM ..... 3/8" min., 7/16" max. where no threshold or carpet; 3/16" min., 1/4" max. at threshold or carpet

**FINISH HARDWARE**: The installation of finish hardware is specified under the section on FINISH HARDWARE.

**FINAL ADJUSTMENTS**: Check and readjust all operating finish hardware items in hollow metal work, just prior to the final inspection. Leave the work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise damaged.

**PAINTING**: Clean and reprime rust spots and any damage to the prime coat of paint before acceptance by the painting subcontractor for field painting. See painting specifications for requirement for one coat of field paint on backs of frames before concealing.

**PROTECTION**: After installation, protect doors and frames from damage during subsequent construction activities. Damaged units will be rejected and must be replaced with new, undamaged units.

END OF SECTION 08110

# SECTION 08200 - FLUSH WOOD DOORS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Solid-core doors with wood-veneer, faces.
2. Shop priming flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections include the following:

1. Division 8 Section "Glazing" for glass view panels in flush wood doors.
2. Division 9 Section "Painting" for field painting flush wood doors.

### 1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, and trim for openings.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate fire ratings for fire doors.

C. Samples for Verification:

1. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required.
2. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

## 1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with NWWDA I.S.1-A, "Architectural Wood Flush Doors."

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: Test at atmospheric pressure
2. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

## 1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

## 1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
2. Warranty shall be in effect during the following period of time from date of Substantial Completion:

   a. Solid-Core Interior Doors: Life of installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flush Wood Doors:

a. Algoma Hardwoods Inc.
b. Buell Door Company.
c. Eggers Industries; Architectural Door Division.
d. Marshfield Doors.

### 2.2 DOOR CONSTRUCTION, GENERAL

A. Doors for Opaque Finish:

1. Grade: Custom.
2. Faces for Interior Doors: Any closed-grain hardwood of mill option.

### 2.3 SOLID-CORE DOORS

A. Particleboard Cores: Comply with the following requirements:

1. Particleboard: ANSI A208.1, Grade LD-2.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
3. Provide doors with either glued-block or structural composite lumber cores instead of particleboard cores at locations where exit devices are indicated.

B. Interior Veneer-Faced Doors:

1. Core: Particleboard.
2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

C. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate through-bolting hardware.
3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.

4. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile matching face veneer, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.
5. Pairs: Furnish formed-steel edges and astragals for pairs of fire-rated doors, unless otherwise indicated.

    a. Finish steel edges and astragals with baked enamel same color as doors.

## 2.4 LIGHT FRAMES

A. Metal Frames for Light Openings in Fire Doors: Manufacturer's standard frame formed of 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet; factory primed and approved for use in doors of fire rating indicated.

## 2.5 FABRICATION

A. Fabricate doors in sizes indicated for Project-site fitting.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.

## 2.6 SHOP PRIMING

A. Doors for Opaque Finish: Shop prime faces and edges of doors, including cutouts, with one coat of wood primer specified in Division 9 Section "Painting."

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Finish Hardware."

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold.

   a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Field-Finished Doors: Refer to the following for finishing requirements:

1. Division 9 Section "Painting."

## 3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors; Replace doors that are damaged or do not comply with requirements. Doors may be repaired if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08211

## SECTION 08211 - COMPOSITE WOOD DOORS

### 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**SUMMARY**: Extent and location of each type of solid core flush wood with wood veneer face door is indicated on drawings and in schedules.

Factory-prefitting to frames and factory-premachining for hardware for wood doors is included in this section.

Installing of doors is specified in Division-6 Section "Finish Carpentry."

Finish hardware is specified in another Division-8 section.

**SUBMITTALS**:

**PRODUCT DATA**: Door manufacturer's technical data for each type of door, including details of core and edge construction, trim for openings, and factory-finishing specifications.

**MANUFACTURER**: Obtain doors from a single manufacturer.

**GENERAL REQUIREMENT**: Before shipment, the top and bottom edges of doors shall be sealed with spar varnish or other approved water-resistant sealer standard with the manufacturer.

**PRODUCT DELIVERY, STORAGE, AND HANDLING**: Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as well as with manufacturer's instructions.

Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

**PROJECT CONDITIONS**: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project's geographical location: Referenced AWI quality standard including Section 100-S-3 "Moisture Content".

**GUARANTEE**: Furnish a five-year guarantee against defects in workmanship and materials which would make the doors unfit for the use intended under this contract. Furnish this guarantee to the architect after the installation has been completed.

### 2.0 PRODUCTS

**PREHUNG, PRE-FINISHED COMPOSITE WOOD DOORS**: Molded composite wood doors creating a six panel traditional appearance; textured wood grain finish; white factory finish. Tempered hardboard molded panels with solid wood internal framing. Prehung in wood frame. Provide internal blocking as required for hardware (some doors require closers).

BASIS OF DESIGN PRODUCT: Doorcraft Interior Molded Textured-Colonial, subject to compliance with requirements, provide either the named product or comparable product.

## 3.0 EXECUTION

**GENERAL**: The installation of doors is specified under Division-6 Section on "Finish Carpentry." Finish hardware is specified under another Division-8 Section on "Finish Hardware."

**PROTECTION**: Protect doors from damage or deterioration until acceptance of the work. Replace any doors damaged prior to final acceptance.

END OF SECTION 08211

## SECTION 08710 - FINISH HARDWARE

### 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**DESCRIPTION OF WORK**: Furnish all items of finish hardware necessary to complete work shown and specified on drawings, details, notes and schedule and/or as specified hereinafter.

While every reasonable precaution has been taken to list all finish hardware items in the following schedule, the possibility of error or omission does not relieve the prime contractor of the responsibility of providing hardware for any and all parts of the building where such items would be normally required in order to properly complete the work; and the type and quality of such items shall be comparable in every respect to items specified for similar work.

**WORK NOT INCLUDED**: The following items are not included under this section but are to be furnished by others as specified elsewhere in the specifications:

Rough hardware and carpenter's ironwork.
Window hardware.
Toilet compartment hardware.
Rolling door and shutter hardware.
Folding door hardware.

**QUALITY STANDARDS**: The function description as used in the schedule establishes the type, quality, material and finish acceptable for each item. Acceptable manufacturers are:

| ITEM | MFR. | APPROVED EQUAL |
|---|---|---|
| Butts | Hager | McKinney, Stanley, Ives, Lawrence |
| Locksets | Falcon | Kwikset, Weiser, Titan, Fala, Schlage |
| Closers | Dorma | LCN |
| Flat Goods | Hager | Ives, Trimco, Rockwood |
| Coordinator | Rockwood | Ives, Hager, Trimco |
| Thresholds | Pemko | Hager, Zero, National Guard |
| Exit Device | Von Duprin | |

**QUALITY ASSURANCE**:

**MANUFACTURER**: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

**SUPPLIER**: A recognized architectural finish hardware supplier who (1) is a factory authorized distributor of Schlage hardware, (2) has a permanent office within 100 miles of jobsite, with warehousing facilities, (3) has been furnishing hardware for a period of not less than 2 years, and (3) is or employs an experienced architectural hardware consultant

who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect/Engineer and Contractor.

**FIRE-RATED OPENINGS**: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements. Provide only hardware which has been tested and listed by UL or FM for types and sizes of doors required and complies with requirements of door and door frame labels.

Where emergency exit devices are required on fire-rated doors (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware".

**EXTERIOR OPENINGS**: Locksets, Exit Devices, Mullions, Hinges, Flush and Surface Bolts, Weather-strip and Thresholds must be certified that assembly meets Florida Building Code windload requirements.

**SUBMITTALS**:

**PRODUCT DATA**: Submit manufacturer's technical product data for each item of hardware in accordance with Division-1 Section "Shop Drawings, Product Data and Samples". Include whatever information may be necessary to show compliance with requirements, include instructions for installation and for maintenance of operating parts and finish, and submit proof of authorized distributorship with shop drawings.

**HARDWARE SCHEDULE**: Submit final hardware schedule in manner indicated below. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware.

**FINAL HARDWARE SCHEDULE CONTENT**: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

Type, style, function, size and finish of each hardware item.

Name and manufacturer of each item.

Fastenings and other pertinent information.

Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.

Explanation of all abbreviations, symbols, codes, etc. contained in schedule.

Mounting locations for hardware.

Door and frame sizes and materials.

Keying information.

**SUBMITTAL SEQUENCE**: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g.,

hollow metal frames and aluminum doors and frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.

**TEMPLATES**: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

**PRODUCT HANDLING**: Tag each item or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.

Packaging of hardware, is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

Inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.

**KEYING AND KEYS**: All cylinders to be keyed into existing Schlage key system and grandmaster and master keyed as required by Owner.

Provide a factory bitting list with door numbers shown for each change key. Factory stamp all keys and blanks "DO NOT DUPLICATE".

Provide:

3 ea. Grand Master Keys.
6 ea. Master keys per set (minimum of 6 sets).
4 ea. Keys per lock.
50 ea. Blanks.

**WIRING DIAGRAMS**: Furnish custom wiring diagrams for electrified hardware interfacing all electrical components in point-to-point wiring diagrams and elevation drawings. Drawings are to show the door number, the location of all accessories such as power supplies, relays, junction boxes, wire type and size and wire runs. Provide 6 copies, along with the Finish Hardware Schedule. Meet with the Electrical Contractor and the installation team for proper coordination.

## 2.0 PRODUCTS

**SELECTION AND ORDERING**: Furnish finish hardware as selected by Architect/Engineer and in such amounts as provided for under other general provisions of the Contract.

**RESPONSIBILITIES OF FINISH HARDWARE SUPPLIER**:

**SUBMITTALS**: Provide through Contractor required Product Data, Final Hardware Schedule, Separate Keying Schedule, and samples as specified in 1.0 GENERAL of this section, unless otherwise indicated.

**CONSTRUCTION SCHEDULE**: Inform Contractor at earliest possible date of estimated times and dates to process submittals, to furnish templates, to deliver hardware, and to perform other work associated with furnishing Finish Hardware for purposes of including in construction progress schedule and then comply with this schedule.

**COORDINATION AND TEMPLATES**: Assist Contractor as required to coordinate hardware with other work in respect to both fabrication and installation. Furnish Contractor with templates and deliver hardware to proper locations.

**PRODUCT HANDLING**: Package, identify, deliver, and inventory hardware as specified in 1.0 GENERAL of this section.

**DISCREPANCIES**: Based on requirements indicated in Contract Documents in effect at time of hardware selection, furnish proper types, finishes, and quantities of finish hardware, including fasteners, and Owner's maintenance tools; and furnish or replace any items of finish hardware resulting from shortages and incorrect items, at no cost to the Owner or Contractor. Obtain signed receipts from Contractor for all delivered materials.

**RESPONSIBILITIES OF CONTRACTOR**:

**SUBMITTALS**: Coordinate and process submittals for Finish Hardware in same manner as submittals for other work.

**CONSTRUCTION SCHEDULE**: Cooperate with Finish Hardware supplier in establishing scheduled dates for submittals and delivery of templates and finish hardware.

**COORDINATION**: Coordinate finish hardware with other work. Furnish hardware supplier or manufacturer with shop drawings of other work where required or requested. Verify completeness and suitability of hardware with supplier.

**PRODUCT HANDLING**: Provide secure lock-up for hardware delivered to the site. Inventory hardware jointly with representative of hardware supplier and issue signed receipts for all delivered materials. Any hardware items lost, damaged or stolen after being accepted by Contractor shall be replaced at Contractor's expense.

**SCHEDULED HARDWARE**: Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware is indicated in the Finish Hardware Data Sheet and Hardware Schedule at the end of this section.

## MATERIALS AND FABRICATION:

### GENERAL:

**HAND OF DOOR**: Drawings show direction of swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

**MANUFACTURER'S NAME PLATE**: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to Architect/Engineer. Manufacturer's identification will be permitted on rim of lock cylinders only.

**BASE METALS**: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

**FASTENERS**: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.

Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.

**TOOLS AND MAINTENANCE INSTRUCTIONS FOR MAINTENANCE**: Furnish complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware.

### HINGES, BUTTS AND PIVOTS:

**TEMPLATES**: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

**SCREWS**: Furnish Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.

**HINGE PINS**: Except as otherwise indicated, provide hinge pins as follows:

**STEEL HINGES**: Steel pins.

**NON-FERROUS HINGES**: Stainless steel pins.

**EXTERIOR DOORS**: Non-removable pins.

**OUT-SWING CORRIDOR DOORS**: Non-removable pins.

**INTERIOR DOORS**: Non-rising pins.

**TIPS**: Flat button and matching plug, finished to match leaves.

**NUMBER OF HINGES**: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90" or less in height and one additional hinge for each 20 inches of additional height.

**LOCK CYLINDERS AND KEYING**: Supplier will meet with Owner's representative to finalize keying requirements and obtain final instructions in writing.

Equip locks with manufacturer's special 6-pin tumbler cylinder, with construction master key feature, which permits voiding of construction keys without cylinder removal.

**METALS**: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver.

**KEY MATERIAL**: Provide keys of nickel silver only.

**LOCKS, LATCHES AND BOLTS**:

**STRIKES**: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.

Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.

Provide roller type strikes where recommended by manufacturer of the latch and lock units.

**LOCK THROW**: Provide 5/8" minimum throw of latch and deadbolt used on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

Provide ½" minimum throw on other latch and deadlock bolts.

Knobs to be of minimum .050" thickness and reinforced with a metal liner of .051" thickness for a total knob thickness of .101" minimum.

**FLUSH BOLT HEADS**: Minimum of ½" diameter rods of brass, bronze or stainless steel, with minimum 12" long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

**EXIT DEVICE DOGGING**: Except on fire-rated doors, wherever closers are provided on doors equipped with exit devices, equip the units with keyed dogging device to hold the push bar down and the latch bolt in the open position.

**RABBETED DOORS (IF ANY)**: Provide special rabbeted front on lock and latch units and bolts.

**PUSH/PULL UNITS:**

**EXPOSED FASTENERS**: Provide manufacturer's standard exposed fasteners for installation; through-bolted for matched pairs, but not for single units.

**CLOSERS AND DOOR CONTROL DEVICES**:

**SIZE OF UNITS**: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.

Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.

Provide parallel arms for all overhead closers, except as otherwise indicated.

**ACCESS-FREE MANUAL CLOSERS**: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.

**COMBINATION DOOR CLOSERS AND HOLDERS**: Provide units designed to hold door in open position under normal usage and to release and automatically close door under fire conditions. Incorporate an integral electromagnetic holder mechanism designed for use with UL listed fire detectors, provided with normally closed switching contacts. Provide integral smoke detector device in combination door closers and holders complying with UL 228.

**BUMPERS**: Provide grey resilient parts for exposed bumpers.

**DOOR TRIM UNITS**:

**FASTENERS**: Provide manufacturer's standard exposed fasteners for door trim units (kick plates, edge trim and similar units); either machine screws of self-tapping screw.

Fabricate protection plates (armor, kick or mop) not more than 2 inches less than door width on stop side and not more than 1" less than door width on pull side, x the height indicated: stainless steel metal plates, .050" (U.S. 18 ga.).

**HARDWARE FINISHES**: Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.

Provide finishes which match those established by BHMA or, if none established, match the Architect/Engineer's sample.

Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.

## 3.0 EXECUTION

**PRE-INSTALLATION MEETING**: Prior to the installation of hardware at the project site, conduct a general orientation meeting, to be attended by the hardware installers, hardware suppliers, manufacturers' technical representatives, the Architect/Engineer, the Owner's representative and the Contractor. Compare the supplied hardware items with the accepted samples of finishes and designs (if any). Review the installation procedures related to the schedules of hardware, doors and frames. Establish final provisions related to security and key control. Examine hardware items for unusual provisions, including special operational features, security devices, UL labels and similar considerations related to installation.

**INSTALLATION**: Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect/Engineer.

Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

**ADJUST AND CLEAN**: Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made. Clean adjacent surfaces soiled by hardware installation.

**FINAL ADJUSTMENT**: Wherever hardware installation is made more than one month prior to acceptance of a space or area, return to the work during the week prior to acceptance and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

**INSTRUCTION**: Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

## 4.0 SCHEDULE OF HARDWARE SETS

**GENERAL**: Manufacturers of hardware items used in this Schedule of Hardware Sets are as follows:

| | |
|---|---|
| Hinges | Hager (HA), Ives (IVE) |
| Exit Devices | Von Duprin (VON) |
| Locksets | Falcon (FA), Schlage (SCH) |
| Trim | Rockwood (RO), Ives (IVE), National Guard Products (NGP) |
| Gasketing | Pemko (PEM), Steelcraft (STE) |
| Closers | LCN (LCN), DOR-O-MATIC (DOR) |
| Over Head Stops | Glynn Johnson (GLY) |
| Computer Locks | Locknetics (LOC) |

Furnish and install the following hardware sets for each door, as called for on the "Door Schedule" on the drawings:

**HW SET:01**

**DOOR NUMBER:**
100 103F 200A 201A

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1HW 4.5 X 4.5 NRP | 630 | IVE |
| 1 | EA | MULLION STABILIZER | 154 | 689 | VON |
| 1 | EA | MULLION | 9954 | 689 | VON |
| 1 | EA | PANIC HARDWARE | CD99EO | 626 | VON |
| 1 | EA | PANIC HARDWARE | CD99NL-OP | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 2 | EA | MORTISE CYLINDER | 20-061 XQ11-948 | 626 | SCH |
| 2 | EA | OFFSET DOOR PULL | 8190-0 | 630 | IVE |
| 1 | SET | ASTRAGAL | 9115A | AL | NGP |
| 2 | EA | SURFACE CLOSER | 1461 DEL CUSH | 689 | LCN |
| 2 | EA | KICK PLATE | 8400 10" X 1" LDW | 630 | IVE |
| 1 | SET | GASKET | PS-074 HEAD AND JAMBS | | STE |
| 1 | EA | THRESHOLD | 950V | AL | NGP |

DOOR, FRAME AND HARDWARE TO MEET THE FBC WINDLOAD REQUIREMENTS

**HW SET:02**

**DOOR NUMBER:**
200

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1HW 4.5 X 4.5 NRP | 630 | IVE |
| 1 | EA | POWER TRANSFER | EPT-10 | 689 | VON |
| 1 | EA | MULLION STABILIZER | 154 | 689 | VON |
| 1 | EA | MULLION | 9954 | 689 | VON |
| 1 | EA | PANIC HARDWARE | CD99EO | 626 | VON |
| 1 | EA | ACCESS CONTROL TRIM | CM993-MGK-17-KD-ATK | 626 | LOC |
| 1 | EA | PANIC HARDWARE | EL99L LESS OST | 626 | VON |
| 1 | EA | MORTISE CYLINDER | 20-061 XQ11-948 | 626 | SCH |
| 1 | EA | OFFSET DOOR PULL | 8190-0 | 630 | IVE |
| 1 | SET | ASTRAGAL | 9115A | AL | NGP |
| 2 | EA | SURFACE CLOSER | 1461 DEL CUSH | 689 | LCN |
| 2 | EA | KICK PLATE | 8400 10" X 1" LDW | 630 | IVE |
| 1 | SET | GASKET | PS-074 HEAD AND JAMBS | | STE |
| 1 | EA | THRESHOLD | 950V | AL | NGP |
| 1 | EA | POWER SUPPLY | PS873-2 | GRY | VON |
| 1 | EA | | WIRING DIAGRAM | | VON |
| 1 | EA | PUSHBUTTON | 621AL AA | 630 | LOC |
| 1 | EA | INTERCOM | BY OTHERS | | B/O |

DOOR, FRAME AND HARDWARE TO MEET THE FBC WINDLOAD REQUIREMENTS

**HW SET:03**

**DOOR NUMBER:**
102A 103B 122

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 5 X 4.5 NRP | 630 | IVE |
| 1 | EA | PANIC HARDWARE | CD99NL-OP | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 1 | EA | MORTISE CYLINDER | 20-061 XQ11-948 | 626 | SCH |
| 1 | EA | OFFSET DOOR PULL | 8190-0 | 630 | IVE |
| 1 | EA | SURFACE CLOSER | 1461 DEL | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 | IVE |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 1 | SET | GASKET | PS-074 HEAD AND JAMBS | | STE |
| 1 | EA | THRESHOLD | 950V | AL | NGP |

DOOR, FRAME AND HARDWARE TO MEET THE FBC WINDLOAD REQUIREMENTS

**HW SET:04**

**DOOR NUMBER:**
212

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 5 X 4.5 NRP | 630 | IVE |
| 1 | EA | POWER TRANSFER | EPT-2 | 689 | VON |
| 1 | EA | PANIC HARDWARE | EL99L LESS OST | 626 | VON |
| 1 | EA | ACCESS CONTROL TRIM | CM993-MGK-17-KD-ATK | 626 | LOC |
| 1 | EA | SURFACE CLOSER | 1461 DEL | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 | IVE |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 1 | SET | GASKET | PS-074 HEAD AND JAMBS | | STE |
| 1 | EA | THRESHOLD | 950V | AL | NGP |
| 1 | EA | POWER SUPPLY | PS873-2 | GRY | VON |
| 1 | EA | | WIRING DIAGRAM | | VON |
| 1 | EA | PUSHBUTTON | 621AL | 630 | LOC |
| 1 | EA | INTERCOM | BY OTHERS | | B/O |

DOOR, FRAME AND HARDWARE TO MEET THE FBC WINDLOAD REQUIREMENTS

**HW SET:05**

**DOOR NUMBER:**
104 125 209

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 630 | IVE |
| 2 | EA | SURFACE BOLT | SB360 | 689 | IVE |
| 1 | EA | STOREROOM LOCK | ND80PD RHO | 626 | SCH |
| 1 | EA | | ONE PIECE Z ASTRAGAL | | STE |
| 1 | EA | SURFACE CLOSER | 1461 CUSH | 689 | LCN |
| 1 | EA | OVERHEAD STOP | 450S | 630 | GLY |
| 1 | SET | GASKET | PS-074 HEAD AND JAMBS | | STE |
| 1 | EA | THRESHOLD | 950V | AL | NGP |

DOOR, FRAME AND HARDWARE TO MEET THE FBC WINDLOAD REQUIREMENTS

**HW SET:06**

**DOOR NUMBER:**
207

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 630 | IVE |
| 2 | EA | SURFACE BOLT | SB360 | 689 | IVE |
| 1 | EA | STOREROOM LOCK | ND80PD RHO | 626 | SCH |
| 1 | EA | | ONE PIECE Z ASTRAGAL | | STE |
| 2 | EA | OVERHEAD HOLDER | 450H | 630 | GLY |
| 1 | SET | GASKET | PS-074 HEAD AND JAMBS | | STE |
| 1 | EA | THRESHOLD | 950V | AL | NGP |

DOOR, FRAME AND HARDWARE TO MEET THE FBC WINDLOAD REQUIREMENTS

**HW SET:07**

**DOOR NUMBER:**
123 124 205 209A 232 247

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 630 | IVE |
| 1 | EA | STOREROOM LOCK | ND80PD RHO | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 1461 | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 | IVE |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 1 | SET | GASKET | PS-074 HEAD AND JAMBS | | STE |
| 1 | EA | THRESHOLD | 950V | AL | NGP |

DOOR, FRAME AND HARDWARE TO MEET THE FBC WINDLOAD REQUIREMENTS

**HW SET:08**

**DOOR NUMBER**:
203B

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 630 | IVE |
| 1 | EA | CLASSROOM LOCK | ND70PD RHO | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 1461 HCUSH | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 | IVE |
| 1 | SET | GASKET | PS-074 HEAD AND JAMBS | | STE |
| 1 | EA | THRESHOLD | 950V | AL | NGP |

DOOR, FRAME AND HARDWARE TO MEET THE FBC WINDLOAD REQUIREMENTS

**HW SET:09**

**DOOR NUMBER**:
121

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 630 | IVE |
| 1 | EA | CLASSROOM LOCK | ND70PD RHO | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 1461 | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 | IVE |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 1 | SET | GASKET | PS-074 HEAD AND JAMBS | | STE |
| 1 | EA | THRESHOLD | 950V | AL | NGP |

DOOR, FRAME AND HARDWARE TO MEET THE FBC WINDLOAD REQUIREMENTS

**HW SET:10**

**DOOR NUMBER**:
229A 251A

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 2 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 630 | IVE |
| 1 | EA | ELECTRIC HINGE | 5BB1 4.5 X 4.5 TW4 | 630 | IVE |
| 1 | EA | EU STOREROOM LOCK | ND96PDEU RHO | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 1461 | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 | IVE |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 1 | SET | GASKET | PS-074 HEAD AND JAMBS | | STE |
| 1 | EA | THRESHOLD | 950V | AL | NGP |
| 1 | EA | POWER SUPPLY | 505-EIR-KLC-CAB-SBP2 | | LOC |
| 1 | EA | | WIRING DIAGRAM | | VON |
| 1 | EA | PUSHBUTTON | 621AL | 630 | LOC |
| 1 | EA | INTERCOM | BY OTHERS | | B/O |

DOOR, FRAME AND HARDWARE TO MEET THE FBC WINDLOAD REQUIREMENTS

**HW SET:11**

**DOOR NUMBER:**
200C

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1HW 4.5 X 4.5 | 652 | IVE |
| 1 | EA | POWER TRANSFER | EPT-2 | 689 | VON |
| 1 | EA | PANIC HARDWARE | CD9947WDC-EO | 626 | VON |
| 1 | EA | PANIC HARDWARE | EL9947WDC-NL-OP | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 1 | EA | MORTISE CYLINDER | 20-061 XQ11-948 | 626 | SCH |
| 2 | EA | OFFSET DOOR PULL | 8190-0 | 630 | IVE |
| 2 | EA | SURFACE CLOSER | 1461 DEL | 689 | LCN |
| 2 | EA | KICK PLATE | 8400 10" X 1" LDW | 630 | IVE |
| 2 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 2 | EA | SILENCER | SR64 | GRY | IVE |
| 1 | EA | POWER SUPPLY | PS873-2 | GRY | VON |
| 1 | EA | | WIRING DIAGRAM | | VON |
| 1 | EA | PUSHBUTTON | 621AL AA | 630 | LOC |

**HW SET:12**

**DOOR NUMBER:**
200B

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1HW 4.5 X 4.5 | 652 | IVE |
| 1 | EA | FIRE EXIT HARDWARE | 9947EO-F | 626 | VON |
| 1 | EA | FIRE EXIT HARDWARE | 9947L-F 996L | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 1 | SET | ASTRAGAL | 9115A | AL | NGP |
| 2 | EA | SURFACE CLOSER | 1461 | 689 | LCN |
| 2 | EA | KICK PLATE | 8400 10" X 1" LDW | 630 | IVE |
| 2 | EA | MAGNETIC HOLD-OPEN | SEM 7840 | AL | LCN |
| 1 | SET | SEALS | 5050B HEAD AND JAMBS | BRN | NGP |

FIRE ALARM TIE IN REQUIRED

**HW SET:13**

**DOOR NUMBER:**
103

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1HW 4.5 X 4.5 | 652 | IVE |
| 2 | EA | FIRE EXIT HARDWARE | 9947WDC-L-F 996L | 626 | VON |
| 2 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 1 | SET | ASTRAGAL | 9115A | AL | NGP |
| 2 | EA | SURFACE CLOSER | 1461 DEL | 689 | LCN |
| 2 | EA | KICK PLATE | 8400 10" X 1" LDW | 630 | IVE |
| 2 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 1 | SET | SEALS | 5050B HEAD AND JAMBS | BRN | NGP |

**HW SET:14**

**DOOR NUMBER:**
101 102 103A 103C

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1HW 4.5 X 4.5 | 652 | IVE |
| 1 | EA | FIRE EXIT HARDWARE | 99L-F 996L | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 1461 DEL | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 | IVE |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 1 | SET | SEALS | 5050B HEAD AND JAMBS | BRN | NGP |

**HW SET:15**

**DOOR NUMBER:**
105 106

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | PASSAGE SET | AL10S SAT | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 1461 DEL | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 | IVE |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 1 | SET | SEALS | 5050B HEAD AND JAMBS | BRN | NGP |

**HW SET:16**

**DOOR NUMBER:**

| | | | | | |
|---|---|---|---|---|---|
| 117 | 119 | 121A | 121B | 203A | 221 |
| 222 | 240 | 240A | 261 | | |

EACH TO HAVE:

| | | | | |
|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 IVE |
| 1 | EA | CLASSROOM LOCK | AL70PD SAT | 626 SCH |
| 1 | EA | SURFACE CLOSER | 1461 DEL | 689 LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 IVE |
| 1 | EA | WALL STOP | WS407CVX | 630 IVE |
| 3 | EA | SILENCER | SR64 | GRY IVE |

**HW SET:17**

**DOOR NUMBER:**

| | | | | | |
|---|---|---|---|---|---|
| 102B | 223 | 238 | 239 | 241 | 242 |
| 245 | 257 | | | | |

EACH TO HAVE:

| | | | | |
|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 IVE |
| 1 | EA | STOREROOM LOCK | AL80PD SAT | 626 SCH |
| 1 | EA | SURFACE CLOSER | 1461 | 689 LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 IVE |
| 1 | EA | WALL STOP | WS407CVX | 630 IVE |
| 1 | SET | SEALS | 5050B HEAD AND JAMBS | BRN NGP |

**HW SET:18**

**DOOR NUMBER:**

103AA

EACH TO HAVE:

| | | | | |
|---|---|---|---|---|
| 6 | EA | HINGE | 5PB1 4.5 X 4.5 | 652 IVE |
| 2 | EA | MANUAL FLUSH BOLT | FB358 | 626 IVE |
| 1 | EA | DUST PROOF STRIKE | DP2 | 626 IVE |
| 1 | EA | CLASSROOM LOCK | AL70PD SAT | 626 SCH |
| 2 | EA | OVERHEAD HOLDER | 451F | 630 GLY |
| 2 | EA | SILENCER | SR64 | GRY IVE |

**HW SET:19**

**DOOR NUMBER:**

| | | | | | |
|---|---|---|---|---|---|
| 103BB | 103D | 103E | 113 | 202 | 213 |
| 218 | 223A | 236 | 237 | 257A | 259 |

EACH TO HAVE:

| | | | | |
|---|---|---|---|---|
| 3 | EA | HINGE | 5PB1 4.5 X 4.5 | 652 IVE |
| 1 | EA | CLASSROOM LOCK | AL70PD SAT | 626 SCH |
| 1 | EA | WALL STOP | WS407CVX | 630 IVE |
| 3 | EA | SILENCER | SR64 | GRY IVE |

**HW SET:20**

**DOOR NUMBER:**

| | | | | | |
|---|---|---|---|---|---|
| 108 | 109 | 110 | 111 | 112 | 114 |
| 220 | | | | | |

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5PB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | OFFICE LOCK | AL50PD SAT | 626 | SCH |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

**HW SET:21**

**DOOR NUMBER:**

| | | | | | |
|---|---|---|---|---|---|
| 118 | 123A | 126 | 127 | 206 | 206A |
| 208 | 210 | 211 | 217 | | |

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | STOREROOM LOCK | AL80PD SAT | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 1461 DEL | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 | IVE |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

**HW SET:22**

**DOOR NUMBER:**

| | | | |
|---|---|---|---|
| 120 | 216 | 233 | 248 |

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | PRIVACY SET | AL40S SAT | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 1461 DEL | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 | IVE |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

**HW SET:23**

**DOOR NUMBER:**

204

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5PB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | CLASSROOM LOCK | ND70PD RHO | 626 | SCH |
| 1 | EA | OVERHEAD STOP | 450S | 630 | GLY |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

**HW SET:24**

**DOOR NUMBER:**
244

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5PB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | PRIVACY SET | AL40S SAT | 626 | SCH |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

**HW SET:25**

**DOOR NUMBER:**

| | | | | | |
|---|---|---|---|---|---|
| 224 | 225 | 226 | 227 | 228 | 230 |
| 231 | 234 | 246 | 249 | 250 | 252 |
| 253 | 254 | 255 | 256 | | |

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5PB1 5 X 4.5 | 652 | IVE |
| 1 | EA | PASSAGE SET | AL10S SAT | 626 | SCH |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

**HW SET:26**

**DOOR NUMBER:**

| | | | | | |
|---|---|---|---|---|---|
| 224A | 225A | 226A | 227A | 228A | 230A |
| 231A | 234A | 246A | 249A | 250A | 252A |
| 253A | 254A | 255A | 256A | | |

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGES | BY DOOR SUPPLIER | | B/O |
| 1 | EA | PRIVACY SET | AL40S SAT | 626 | SCH |
| 1 | EA | DOOR STOP | 060 | 669 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

**HW SET:27**

**DOOR NUMBER:**

| | | | | | |
|---|---|---|---|---|---|
| 224B | 225B | 226B | 227B | 228B | 230B |
| 231B | 234B | 246B | 249B | 250B | 252B |
| 253B | 254B | 255B | 256B | | |

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGES | BY DOOR SUPPLIER | | B/O |
| 1 | EA | PASSAGE SET | AL10S SAT | 626 | SCH |
| 1 | EA | DOOR STOP | 060 | 669 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

**HW SET:28**

**DOOR NUMBER:**
203

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | CLASSROOM LOCK | AL70PD SAT | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 1461 DEL | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 | IVE |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |
| 1 | EA | MAGNETIC HOLD-OPEN | SEM7840 | AL | LCN |

**HW SET: 29**

**DOOR NUMBER:**
229 251

EACH TO HAVE:

| | | | | | |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 5 X 4.5 NRP | 630 | IVE |
| 1 | EA | PANIC HARDWARE | CD99NL-OP | 626 | VON |
| 1 | EA | RIM CYLINDER | 20-057 | 626 | SCH |
| 1 | EA | MORTISE CYLINDER | 20-061 XQ11-948 | 626 | SCH |
| 1 | EA | OFFSET DOOR PULL | 8190-0 | 630 | IVE |
| 1 | EA | SURFACE CLOSER | 1461 DEL | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW | 630 | IVE |
| 1 | EA | WALL STOP | WS407CVX | 630 | IVE |
| 1 | SET | GASKET | PS-074 HEAD AND JAMBS | | STE |
| 1 | EA | THRESHOLD | 950V | AL | NGP |
| 1 | EA | DOOR POSITION SWITCH | 7764 | 628 | LOC |
| 1 | EA | DOOR CHIME | BY OTHERS | | B/O |

DOOR, FRAME AND HARDWARE TO MEET THE FBC WINDLOAD REQUIREMENTS
COORDINATE DOOR CONTACT WITH DOOR CHIME

**HW SET: 30**

**DOOR NUMBER:**
EXTRA

EACH TO HAVE:

| | | | | |
|---|---|---|---|---|
| 1 | EA | CREDENTIAL RDR MAGCRM | | LOC |
| 1 | EA | INTERFACE PACK | EXCIP+ | LOC |
| 100 | EA | MAG STRIPE CARD | MAG1 | LOC |
| 1 | EA | PROGRAMMING KIT | IRPDA | LOC |

END OF SECTION 08710

# SECTION 08800 - GLAZING

## 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**SUMMARY**: This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:

Entrances and other doors.

Windows

**DEFINITIONS**: Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.

Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices fro maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

**SYSTEM PERFORMANCE REQUIREMENTS**:

**GENERAL**: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.

**GLASS DESIGN**: Glass thicknesses indicated on Drawings are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:

Minimum glass thickness, nominally, of lites in interior doors is 1/4 inch. Note: Exterior wall lites shall be 3/4-inch (max) insulating units with two 1/4 inch (max) lites separated by ½ inch (min) air space.

Design Wind Loads;

Basic Wind Speed: 110 mph, refer to Drawings.

**SUBMITTALS**:

**GENERAL**: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

Product data for each glass product and glazing material indicated.

Samples for verification purposes of 12-inch-square samples of each type of glass indicated except for clear monolithic glass products, and 12-inch-long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.

Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.

Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

Compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.

Product test reports for each type of glazing sealant and gasket indicated, evidencing compliance with requirements specified.

Maintenance data for glass and other glazing materials to include in Operating and Maintenance Manual specified in Division 1.

**QUALITY ASSURANCE**:

**GLAZING PUBLICATIONS**: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

**FGMA PUBLICATIONS**: "FGMA Glazing Manual."

**SAFETY GLASS**: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

**GLAZIER QUALIFICATIONS**: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.

**SINGLE-SOURCE RESPONSIBILITY FOR GLASS**: Obtain glass from one source for each product indicated below:

Clear float glass, laminated glass, and insulating glass.

**SINGLE-SOURCE RESPONSIBILITY FOR GLAZING ACCESSORIES**: Obtain glazing accessories from one source for each product and installation method indicated.

**INSULATING-GLASS CERTIFICATION PROGRAM**: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

Insulating Glass Certification Council.
Associated Laboratories, Inc.

**DELIVERY, STORAGE, AND HANDLING**: Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

**PROJECT CONDITIONS**:

**ENVIRONMENTAL CONDITIONS**: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.

Install liquid sealants at ambient and substrate temperatures above 40 deg F (4.4 deg C).

**WARRANTY**

Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

Warranty Period: 10 years from date of Substantial Completion.

Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

Warranty Period: 5 years from date of Substantial Completion.

## 2.0 PRODUCTS

**PRIMARY GLASS STANDARD**: Provide primary glass which complies with ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.

**HEAT-TREATED GLASS STANDARD**: Provide heat-treated glass which complies with ASTM C 1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

**LAMINATED GLASS**: ASTM C 1172, and complying with other requirements specified and with the following:

Interlayer: Polyvinyl butyral of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.

For polyvinyl butyral interlayers, laminate lites in autoclave with heat plus pressure.

Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.

**SIZES**: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

**HEAT-TREATED GLASS PRODUCTS**:

**UNCOATED TINTED HEAT-ABSORBING FLOAT GLASS**: 1/4" thick (max), gray tint, and both tempered and not tempered as indicated, equal to PPG Solargray with 44% and 40% (insulating-glass unit) visible transmittance. Used as outboard lite in insulating-glass unit.

**INSULATING-GLASS UNITS, GENERAL:** Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

Provide Kind FT (fully tempered) glass lites where safety glass is indicated.

Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thickness of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

Insulating-glass unit thickness: 3/4 inch (max).

Sealing System: Dual seal, with primary and secondary sealants as follows: Manufacturer's standard sealants.

Spacer Specifications: Manufacturer's standard spacer material and construction.

**LAMINATED-GLASS UNITS**: GENERAL: Factory-assembled units consisting of two lites of annealed float glass with plastic interlayer and complying with requirements specified in this Article and in Part 2 "Laminated" Glass Units Article.

Outer Lite: Class 2 (tinted) float glass.

Tint Color: PPG Industries, Inc.; Solargray
Thickness: 6.0 mm.

Plastic Interlayer:

Thickness: 0.060 inch (1.52 mm).
Interlayer Color: Clear.

Inner Lite: Class 1 (clear) float glass.

Thickness: 6.0 mm.

Visible Light transmittance: 43 percent minimum.
Winter Nighttime U-Factor: 0.95 maximum.
Summer Daytime U-Factor: 0.86 maximum.
Solar Heat Gain Coefficient: 0.52 maximum.
Outdoor Visible Reflectance: 6 percent maximum.

**GLAZING COMPOUNDS AND SEALANTS**: Select glazing compounds and sealants of proven compatibility with other materials in contact, including glass products and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.

## 3.0 EXECUTION

**EXAMINATION**: Examine glass framing, with glazier present, for compliance with the following:

Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.

Presence and functioning of weep system.

Minimum required face or edge clearances.

Effective sealing between joints of glass-framing members.

Do not proceed with glazing until unsatisfactory conditions have been corrected.

**PREPARATION**: Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

**GLAZING, GENERAL**: Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

Protect glass from edge damage during handling and installation as follows:

Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.

Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.

Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:

Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.

Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.

Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

**LOCK-STRIP GASKET GLAZING**: Comply with ASTM C 716 and gasket manufacturer's printed recommendations. Provide supplementary wet seal and weep system unless otherwise indicated.

**PROTECTION AND CLEANING**: Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08800

## SECTION 08920 - ALUMINUM WINDOWS

### 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**SUMMARY**: This Section includes aluminum fixed windows and entrance systems.

Primary components of the aluminum systems include:

Aluminum fixed windows.

Aluminum casement windows.

Covers, soffits, sills, trim and similar border and filler items.

Anchors, shims, fasteners, inserts, accessories, and support brackets.

**GLAZING**: Refer to "Glazing" section of Division-8 for glass and glazing requirements, including units specified or required to be factory-preglazed.

**WIND LOADING**: Provide assemblies capable of withstanding a uniform test pressure inward and outward when tested in accord with ASTM E 330 as follows:

**BASIC WIND**: 110 mph.

**VELOCITY PRESSURES**:

From Ground Floor up to 15 ft. - 17 psf.
15 ft. up to 40 ft. - 19 psf.

**SUBMITTALS**:

**GENERAL**: Submit the following:

**PRODUCT DATA**: Submit manufacturer's specifications for materials and fabrication, installation instructions, and recommendations for maintenance. Include test reports showing compliance with project requirements where test method is indicated. Include the following information:

Fabrication methods.
Finishing.
Hardware.
Accessories.

**SHOP DRAWINGS**: Show adaptation of manufacturer's standard systems to the project; include typical unit elevations at ½-inch scale and details at 3-inch scale. Show dimensions, profiles of members, reinforcements, expansion provisions, anchorage systems, interfaces with building construction, and glazing.

Include setting drawings, templates, and directions for the installation of anchor bolts and other anchorages installed as a unit of work under other sections.

**TEST REPORTS**: Provide test reports from a qualified independent testing laboratory that show compliance of the systems with performance requirements indicated based on comprehensive testing of the systems by the laboratories.

**QUALITY ASSURANCE**:

**INSTALLER QUALIFICATIONS**: Engage an experienced Installer who has successfully completed installation of systems similar in material, design, and extent to those indicated for the Project and who is acceptable to the manufacturer of each system.

**GLAZING STANDARDS**: Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or referenced standards.

**SINGLE-SOURCE RESPONSIBILITY**: Provide each system for the project from one source from a single manufacturer.

**PROJECT CONDITIONS**:

**FIELD MEASUREMENTS**: Take field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

**SEQUENCING AND SCHEDULING**: Schedule installation of the glazed aluminum curtain wall system in sequence with related elements of the Work specified in other Sections to ensure that wall assemblies, including flashing, trim, and joint sealers, are protected against damage from effects of weather, age, corrosion, and other causes.

**PROTECTIVE COVERING**: Prior to shipment from the factory, finished surfaces shall receive a protective covering. Covering shall not tear, chip, peel or flake due to temperature or weather, and shall protect against discoloration and surface damage from transportation, storage and construction activities. Covering shall be readily removable without affecting the finish.

**WARRANTY**: Submit written guarantee signed by the manufacturer, installer and contractor, agreeing to replace systems' units which fail in materials or workmanship within 3 years of the date of acceptance. Failure of materials or workmanship shall include (but not be limited to) water leakage or excessive air infiltration, excessive deflections, deterioration of finish or metal in excess of normal weathering, and defects in accessories, weatherstripping and other components of the work.

## 2.0 PRODUCTS

**BASIS OF DESIGN PRODUCT**: PGT Industries Series 6001, Fixed and Series 700 Casement; subject to compliance with requirements, provide the named product.

**ALUMINUM FINISH**: Painted white.

**GLASS**: Tinted, insulating-glass equal to PPG Solargray at 40% Visible Light Transmission, units complying with Division 8 Section "Glazing".

**BRAKE METAL**: As recommended by the system manufacturer. Match window finish.

**FASTENERS**: Anodized aluminum or non-magnetic stainless steel of the type which will not cause electrolytic action or corrosion. Provide Phillips flat-head screws where exposed unless otherwise shown. Finish exposed aluminum fasteners to match aluminum work.

**BRACKETS AND REINFORCEMENTS**: Provide aluminum brackets and reinforcements wherever necessary.

**FABRICATION**:

**GENERAL**: Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to cleaning, finishing, treatment and application of coatings.

Weld by methods recommended by the manufacturer and AWS to avoid discoloration at welds. Grind exposed welds smooth and restore mechanical finish. Remove arrises from cut edges and ease edges and corners to a radius of approximately 1/64".

Conceal fasteners wherever possible.

Fit and assemble the work at the shop to the greatest extent possible. Disassemble only as required for shipment and erection. Maintain true continuity of line and accurate relation of planes and angles. Provide secure attachment and support at mechanical joints, with hairline fit of contacting members.

Reinforce the work as necessary for performance requirements, and for support to the system. Separate dissimilar metals with bituminous paint or preformed separators which will prevent corrosion. Separate metal surfaces at moving joints with plastic inserts or other non-abrasive concealed inserts which will permanently prevent "freeze-up" of the joint.

## 3.0 EXECUTION

**PREPARATION**: Furnish inserts at proper times for setting in masonry and similar work indicated to support system work.

**INSTALLATION**: Comply with manufacturer's instructions for protecting, handling, and installing fabricated curtain wall components, with particular care and attention to preservation of applied finishes. Discard or remove and replace damaged members.

Anchor components securely in place in the manner indicated or required. Shim and allow for movement resulting from changes in thermal conditions. Provide separators and isolators to prevent corrosion, electrolytic deterioration, and freeze-up of moving joints.

**GLAZING**: Comply with requirements specified in "Glazing" section and as recommended by systems' manufacturers.

**SEALANTS AND JOINT FILLERS**: Comply with requirements specified in "Joint Sealers" and "Glazing" sections.

**ERECTION TOLERANCES**: Install components plumb, level, accurately aligned, and located in reference to column lines and floor levels. Adjust work to conform to the tolerances indicated below. Tolerances indicated below are maximum and are not cumulative.

**PLUMB**: 1/8 inch in 10 feet; 1/4 inch in 40 feet.

**LEVEL**: 1/8 inch in 20 feet; 1/4 inch in 40 feet.

**ALIGNMENT**: Limit offset of member alignment to 1/16 inch where surfaces are flush or less than ½ inch out of flush and separated by less than 2 inches by a reveal or protruding work; otherwise limit offsets to 1/8 inch.

**LOCATION**: 3/8-inch maximum deviation from the measured theoretical location of any member at any location.

**CLEANING**: Clean each completed system, inside and out, promptly after erection and installation of glass and sealants, allowing for nominal curing of liquid sealants. The installer shall advise the Contractor of proper and adequate procedures for protection and cleaning during the remainder of the construction period so that the system will be without damage and deterioration at the time of acceptance.

At the time of Substantial Completion, clean each system thoroughly and polish glass. Demonstrate proper cleaning methods and materials to the Owner's maintenance personnel.

END OF SECTION 08920

# SECTION 09220 - PORTLAND CEMENT PLASTER

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Exterior portland cement plasterwork (stucco) on solid-plaster bases.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for solid-plaster base.
2. Division 6 Section "Rough Carpentry" for wood blocking, nailers, and furring, included in portland cement plaster assemblies.
3. Division 7 Section "Joint Sealants" for sealants installed with exterior portland cement plaster (stucco).

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.

C. Samples for Verification: For each type of textured finish coat indicated; 12 by 12 inches (305 by 305 mm), and prepared on rigid backing.

### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

### 1.5 PROJECT CONDITIONS

A. Comply with ASTM C 926 requirements.

B. Exterior Plasterwork:

1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
2. Apply plaster when ambient temperature is greater than 40 deg F (4.4 deg C).
3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

### 2.2 ACCESSORIES

A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Zinc and Zinc-Coated (Galvanized) Accessories:

1. Available Manufacturers:

   a. Alabama Metal Industries Corporation (AMICO).
   b. Dale/Incor.
   c. Dietrich Industries, Inc.

2. Foundation Weep Screed: Fabricated from hot-dip galvanized steel sheet, ASTM A 653/A 653M, G60 (Z180) zinc coating.
3. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
4. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.

   a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
   b. Small nose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing masonry corners.

5. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
6. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with

perforated flanges and removable protective tape on plaster face of control joint.

7. Expansion Joints: Fabricated from zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.

## 2.3 MISCELLANEOUS MATERIALS

A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Bonding Compound: ASTM C 932.

C. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of not fewer than three exposed threads.

D. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.

E. Isolation Strip at Exterior Walls:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), unperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.1 mm) thick, in width to suit steel stud size.

F. Sealant for Exposed and Concealed Joints: See Division 7 Section "Joint Sealants."

## 2.4 PLASTER MATERIALS

A. Portland Cement: ASTM C 150, Type I.

1. Color for Finish Coats: Gray.

B. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.

C. Sand Aggregate: ASTM C 897.

1. Color for Job-Mixed Finish Coats: White.

## 2.5 PLASTER MIXES

A. Base-Coat Mixes for Use over Concrete Unit Masonry: Single base coats for two-coat plasterwork as follows:

1. Portland Cement Mix: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material (sum of separate volumes of each component material).

B. Job-Mixed Finish-Coat Mixes:

1. Portland Cement Mix: For cementitious materials, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material (sum of separate volumes of each component material).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

B. Prepare solid-plaster bases that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

### 3.3 INSTALLATION, GENERAL

A. Sealant: Where required, seal joints between edges of plasterwork and abutting construction with acoustical sealant.

### 3.4 INSTALLING ACCESSORIES

A. Install according to ASTM C 1063 and at locations indicated on Drawings.

B. Reinforcement for External Corners:

1. Install cornerbead at exterior locations.

C. Control Joints: Install control joints at locations indicated on Drawings.
1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:

a. Vertical surfaces: 144 sq. ft. (13.4 sq. m).
b. Horizontal and other nonvertical surfaces: 100 sq. ft. (9.3 sq. m).

2. At distances between control joints of not greater than 18 feet (5.5 m) o.c.

### 3.5 PLASTER APPLICATION

A. General: Comply with ASTM C 926.

1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6.4 mm in 3 m) from a true plane in finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed on surface.
2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Bonding Compound: Apply on unit masonry and concrete plaster bases.

C. Plaster Finish Coats: Apply to provide float finish to match existing surfaces.

## 3.6 CUTTING AND PATCHING

A. Cut, patch, replace, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections. Repair or replace work to eliminate blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

## 3.7 CLEANING AND PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from doorframes, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09220

# SECTION 09260 - GYPSUM BOARD ASSEMBLIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum wallboard.
2. Tile backing panels.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for wood blocking, nailers, and furring.
2. Division 7 Section "Building Insulation" for insulation installed in gypsum board assemblies.

### 1.3 DEFINITIONS

A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

### 1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory."

B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1. STC-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."

### 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

### 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Gypsum Board and Related Products:

a. BPB America, Inc.
b. G-P Gypsum Corp.
c. National Gypsum Company.
d. United States Gypsum Co.

### 2.2 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36.

1. Regular Type:

a. Thickness: 5/8 inch (15.9 mm).
b. Long Edges: Tapered.
c. Location: As indicated.

2. Type X:

a. Thickness: 5/8 inch (15.9 mm).
b. Long Edges: Tapered.
c. Location: Where required for fire-resistance-rated assembly.

## 2.3 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Custom Building Products; Wonderboard.
b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
c. United States Gypsum Co.; DUROCK Cement Board.

2. Thickness: 1/2 inch (12.7 mm).

## 2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

a. Cornerbead: Use at outside corners.
b. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
c. L-Bead: L-shaped; exposed long leg receives joint compound; use where indicated.
d. U-Bead: J-shaped; exposed short flange does not receive joint compound; use at exposed panel edges.
e. Expansion (Control) Joint: Use where indicated.

## 2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

## 2.6 ACOUSTICAL SEALANT

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

## 2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Isolation Strip at Exterior Walls:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

F. Thermal Insulation: As specified in Division 7 Section "Building Insulation."

G. Polyethylene Vapor Retarder: As specified in Division 7 Section "Building Insulation."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

F. Attach gypsum panels to framing provided at openings and cutouts.

G. Form control and expansion joints with space between edges of adjoining gypsum panels.

H. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect open structural members projecting below underside of roof slabs, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

I. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

J. Floating Construction: Where feasible, including where recommended in writing by manufacturer, install gypsum panels over wood framing, with floating internal corner construction.

K. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.

L. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

## 3.3 PANEL APPLICATION METHODS

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of board.

B. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

C. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

D. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.

E. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

F. Tile Backing Panels:

1. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
2. Areas Not Subject to Wetting: Install standard gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.
3. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.

## 3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

## 3.5 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated.
3. Level 3: Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges where indicated, at non-critical lighting areas.

4. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated, standard exposed finish.
5. Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface where indicated, exposed surfaces receiving gloss and semigloss enamel paint and is subject to severe lighting.

E. Cementitious Backer Units: Finish according to Manufacturer's written instructions.

## 3.6 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:

    a. Installation of 80 percent of lighting fixtures, powered for operation.
    b. Installation, insulation, and leak and pressure testing of water piping systems.
    c. Installation of air-duct systems.
    d. Installation of air devices.
    e. Installation of mechanical system control-air tubing.
    f. Installation of ceiling support framing.

END OF SECTION 09260

## SECTION 09300 - TILE

### 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**SUMMARY**: This Section includes the following:

Matte finish paver tile for floors and base.
Ceramic Mosaic tile.
Quarry tile and base.
Glazed wall tile.
Marble sills and thresholds.

**RELATED SECTIONS**: The following sections contain requirements that relate to this Section:

Division 3 Section "Concrete Work" for slab finishes specified for tile substrates.
Division 9 Section "Gypsum Board Assemblies" for tile backing panels.

**SUBMITTALS**:

**GENERAL**: Submit the following in accord with Conditions of Contract and Division 1 Specification Sections.

Product data for each type of product specified.

Shop drawings indicating tile patterns and locations and widths of expansion, contraction, control, and isolation joints in any tile substrates and finished tile surfaces.

Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures, and patterns available for each type and composition of tile indicated . Include samples of grout and accessories involving color selection.

Samples for verification purposes of each item listed below, prepared on samples of size and construction indicated, products involve color and texture variations, in sets showing full range of variations expected.

Each type and composition of tile and for each color and texture required, at least 12 inches square, mounted on plywood or hardboard backing and grouted.

Full-size units of each type of trim and accessory for each color required.

Marble sills and thresholds in 6-inch lengths.

Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of tile and tile setting and grouting products with requirements indicated.

Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience.

**QUALITY ASSURANCE**:

**SINGLE-SOURCE RESPONSIBILITY FOR TILE**: Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

**SINGLE-SOURCE RESPONSIBILITY FOR SETTING AND GROUTING MATERIALS**: Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

**INSTALLER QUALIFICATIONS**: Engage an experienced Installer who has successfully completed tile installations similar in material, design, and extent to that indicated for Project.

**PREINSTALLATION CONFERENCE**: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings".

**DELIVERY, STORAGE, AND HANDLING**: Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

Handle tile with any temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If despite these precautions coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

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

Vent any temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

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

**ACCEPTANCE OF SURFACES AND CONDITIONS**:

**NOTIFICATION**: Notify the Architect/Engineer or other designated authority of any defects or conditions that will prevent satisfactory tile work.

**ACCEPTANCE**: The starting of tile work implies the acceptance of surfaces as follows:

Surfaces are dry, clean, free of oil or wax and firm.

Subfloor surfaces vary not more than 1/4" in 10 ft. from the required elevations.

The plane of wall surfaces is plumb and true, with square corners and variations of not more than 1/4" in 8 ft.

Grounds, anchors, plugs, hangers, bucks, electrical work or mechanical work are installed behind the tile.

Adjoining work and materials not to receive tile are protected.

**EXTRA MATERIALS**: Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents. Furnish quantity of full-size units equal to 3 percent of amount of tile and trim installed, for each type, composition, color, pattern, and size.

## 2.0 PRODUCTS

**TILE MANUFACTURERS**: Subject to compliance with requirements, provide products by one of the following or pre-approved equal:

**PORCELAIN PAVER (HARD) TILES CT - 1**:

American Olean
Crossville Ceramics
Dal-Tile
Florida Tile

**UNGLAZED CERAMIC MOSAIC TILES CT- 2:**

American Olean
Dal-Tile

**QUARRY TILES QT:**

American Olean
Florida Tile
Quarry Tile Company

**GLAZED WALL TILES CT - 3**:

American Olean
Dal-Tile
Florida Tile

**PRODUCTS, GENERAL**:

**ANSI STANDARD FOR CERAMIC TILE**: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.

**ANSI STANDARD FOR TILE INSTALLATION MATERIALS**: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

**FACTORY BLENDING**: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

**TILE PRODUCTS**:

**PORCELAIN PAVER (HARD) TILES**: Provide porcelain tile meeting the following criteria:

| | |
|---|---|
| Water Absorption | ASTM C-373 |
| Frost Resistance | ASTM C-1026 |
| Abrasive Hardness | ASTM C-501 |
| Breaking Strength | ASTM C-648 |
| Thickness Range | ASTM C-499 |
| Facial Dimension | ASTM C-499 |
| Warpage (Diagonal) | ASTM C-485 |
| Wedging | ASTM C-502 |
| Bonding Strength | ASTM C-482 |
| Chemical Resistance | Acid 10% Hcl<br>Unaffected<br>Alkali 10% KOH<br>Unaffected |
| Robinson Floor Test | Performance Rating<br>Extra Heavy Cycles<br>Passed: 14 |

**BASIS OF DESIGN**: American Olean, Mythos (striated stone look). Comparable products of Crossville Ceramics, and Dal-Tile acceptable.

Other manufacturers meeting or exceeding these standards are acceptable.

**SIZE AND TEXTURE**: 16 x 16 matte finish.

**COLORS**: Provide minimum of 8 colors for selection.

**UNGLAZED CERAMIC MOSAIC TILE**: Provide unglazed ceramic mosaic tile with the following characteristics:

**COMPOSITION**: Vitreous or impervious natural clay or porcelain.

**SURFACE**: Smooth, without abrasive admixture.

**MODULE SIZE**: 2 by 2 inches.

**NOMINAL THICKNESS**: 1/4 inch.

**FACE**: Plain, with cushion edges.

**COLOR**: Selected from manufacturer's full range.

**BASIS OF DESIGN PRODUCT**: Dal-Tile Mosaics Unglazed; Keystones; subject to compliance requirements, provide either named product or comparable product of manufacturers listed.

**UNGLAZED QUARRY TILE**: Provide unglazed cushion-edge flat tile with the following characteristics:

**COMPOSITION**: Impervious natural clay.

**SURFACE**: Nonabrasive, textured.

**MODULE SIZE**: 8 by 8 inches.

**NOMINAL THICKNESS**: ½ inch

**FACE**: Plain.

**COLOR**: Selected from manufacturer's full range.

**BASIS-OF-DESIGN PRODUCT**: American Olean; Quarry Naturals (Flash) or a comparable product of manufacturer's listed.

**QUARRY TILE TRIM UNITS**: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:

**BASE**: Coved with surface bullnose top edge, facial dimensions 8 by 3-7/8 inches.

**GLAZED WALL TILE**: Provide glazed flat wall tile with the following characteristics:

**MODULE SIZE**: 4 1/4 by 4 1/4 inches.

**THICKNESS**: 5/16 inch.

**FACE**: Plain, with cushion edge.

**FINISH**: Semimat, clear glaze.

**COLOR**: Selected from manufacturer's full range.

**BASIS-OF-DESIGN PRODUCT**: Dal-Tile Wall Tile, Semi-gloss Matte; subject to compliance with requirements, provide either named product or comparable product of manufacturer's listed.

**TRIM UNITS**: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:

**SIZE**: As indicated or required, coordinated with sizes and coursing of adjoining flat tile where applicable.

**SHAPES**: As indicated or required, selected from manufacturer's standard shapes.

**ACCESSORIES FOR GLAZED WALL TILE**: Provide vitreous china accessories of type and size indicated, in color and size indicated, in color and finish to match adjoining flat wall tile, and intended for installing by same method as adjoining wall tile.

One soap holder with grab handle for each shower and tub indicated. One towel holder with acrylic bar for each shower and tub indicated.

**MARBLE THRESHOLDS**: Use thresholds of Group I, domestic white marble.

**SETTING MATERIALS**:

**PORTLAND CEMENT MORTAR INSTALLATION MATERIALS**: Provide materials complying with ANSI A108.1 and as specified below.

**EXPANDED METAL LATH**: Provide diamond mesh lath complying with ASTM C 847. Fabricate lath from zinc-coated (galvanized) steel sheet.

**CONFIGURATION OVER STUDS AND FURRING**: Flat.

**CONFIGURATION OVER SOLID SURFACES**: Self-furring.

**WEIGHT**: 3.4 psf.

**DRY-SET PORTLAND CEMENT MORTAR**: ANSI A118.1.

**POLYMER MODIFIED DENSE GROUT**: ANSI A118.6, sanded. Provide choice of a minimum of 24 colors.

**ELASTOMERIC SEALANTS**:

**GENERAL**: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with requirements of Division 7 Section "Joint Sealers," including ASTM C 920 as referenced by Type, Grade, Class, and Uses.

**COLORS**: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

**MISCELLANEOUS MATERIALS**:

**WATER**: Water shall be potable.

**METAL EDGE STRIPS**: Zinc alloy or stainless steel terrazzo strips, 1/8-inch wide at top edge with integral provision for anchorage to mortar bed or substrate if indicated or required.

**MIXING MORTARS AND GROUT**: Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

## 3.0 EXECUTION

**EXAMINATION**: Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile. Do not proceed with installation until unsatisfactory conditions have been corrected.

**PREPARATION**:

**BLENDING**: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

**FIELD-APPLIED TEMPORARY PROTECTIVE COATING**: Where needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of temporary protective coating recommended by the tile manufacturer, taking care not to coat unexposed tile surfaces.

**INSTALLATION, GENERAL**:

**ANSI TILE INSTALLATION STANDARD**: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.

**TCA INSTALLATION GUIDELINES**: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated.

Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.

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

**SEALANT JOINTS**: Locate any sealant-filled joints, including control, contraction, and isolation joints, where indicated or required during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation of tiles. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealers."

**GROUTING**: Grout tile to comply with ANSI A108.10.

**FLOOR INSTALLATION METHODS**: Install tile to comply with TCA installation methods related to types of subfloor construction and grout types.

**MARBLE THRESHOLDS**: Install marble thresholds at locations indicated; set in same type of setting bed as abutting field tile unless otherwise indicated.

**MARBLE SILLS**: Install marble sills at locations indicated; set in same type of setting bed as tile.

**WALL TILE INSTALLATION METHODS**: Install types of tile designated for wall application to comply with TCA installation methods related to wall conditions and grout types.

**KNEELING BOARDS**: Use kneeling boards for working and walking on newly-tiled floors during installation.

**CURING**: Cure horizontal tile installations by keeping damp for a minimum of three days.

**CLEANING AND PROTECTION**:

**CLEANING**: Upon completion of placement and grouting, clean all tile surfaces free of foreign matter.

Tile may be cleaned with solutions only permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from any harmful effects of cleaning. Flush surface with clean water before and after cleaning.

Remove any temporary protective coating by method recommended by coating manufacturer that is acceptable to grout manufacturer. Trap and remove coating to prevent its clogging drains.

**FINISHED TILE WORK**: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures that tile is without damage or deterioration at time of Substantial Completion.

When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

Prohibit foot and wheel traffic on tiled floors for at least 7 days after grouting is completed.

Before final inspection, remove any protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09300

# SECTION 09511 - ACOUSTICAL PANEL CEILINGS

## 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**SUMMARY**: This Section includes acoustical panel ceilings installed with exposed suspension systems.

**RELATED SECTIONS**: The following sections contain requirements that relate to this section:

Another Division 9 Section "Veneer Plaster."

Division 15 Section for grilles, registers, and diffusers in acoustical ceilings.

Division 16 Section for lighting fixtures in acoustical ceilings.

**QUALITY ASSURANCE**:

**INSTALLER QUALIFICATIONS**: Engage an experienced Installer who has successfully completed acoustical ceilings similar in material, design, and extent to those indicated for Project.

**SURFACE BURNING CHARACTERISTICS**: Provide acoustical ceilings that are identical to those tested for the following fire-performance characteristics, per ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.

**FLAME SPREAD**: 25 or less.

**SMOKE DEVELOPED**: 50 or less.

**SINGLE-SOURCE RESPONSIBILITY FOR CEILING UNITS**: Obtain each type of acoustical ceiling unit from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

**SINGLE-SOURCE RESPONSIBILITY FOR SUSPENSION SYSTEM**: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

**COORDINATION OF WORK**: Coordinate layout and installation of acoustical ceiling units and suspension system components with other construction that penetrates ceilings or is supported by acoustical ceiling system, including light fixtures, HVAC equipment, and partition systems.

**DELIVERY, STORAGE, AND HANDLING**: Deliver acoustical ceiling units to project site in original, unopened packages and store in a fully enclosed space, protected against damage from moisture, direct sunlight, surface contamination, and other causes.

Before installing acoustical ceiling units, permit units to reach room temperature and a stabilized moisture content.

Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

**PROJECT CONDITIONS**:

**SPACE ENCLOSURE**: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

**EXTRA MATERIALS**: Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels.

**ACOUSTICAL CEILING UNITS**: Furnish quantity of full-size units, including gypsum drywall panels, equal to 2.0 percent of amount installed.

**EXPOSED SUSPENSION SYSTEM COMPONENTS**: Furnish quantity of each exposed component equal to 2.0 percent of amount installed.

## 2.0 PRODUCTS

**ACOUSTICAL CEILING UNITS**:

**ACOUSTICAL TILE**: Basis of Design Product: APC-1 Armstrong Fine Fissured with reveal edge; subject to compliance with requirements, provide either the named product or comparable product of manufacturers listed. Comparable products from Celotex and USG are acceptable. APC-2 Armstrong Ceramaguard (Nonperforated) with square edge; Subject to compliance with requirements, provide either the named product or comparable product of manufacturers listed. Comparable products from Celotex and USG are acceptable.

**METAL SUSPENSION SYSTEMS, GENERAL**: Basis of Design Product: Armstrong Prelude Plus XL Fire Guard 15/16" Environmental exposed tee-grid, white, subject to compliance with requirement, provide either the named product or a comparable product.

At APC-2, provide Armstrong 15/16" Co-Extruded (aluminum) Clean Room exposed tee-grid, white PVC-finish, subject to compliance with requirement, provide either the named product or a comparable product.

**ATTACHMENT DEVICES**: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

**WIRE FOR HANGERS AND TIES**: ASTM A 641, Class 1 zinc coating, soft temper. Provide wire sized so that stress at 3 times hanger design load (ASTM C 635, Table 1, Direct-Hung), will be less than yield stress of wire, but provide not less than 0.106-inch diameter (12 gage).

**EDGE MOLDINGS AND TRIM**: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit type of edge detail and suspension system indicated.

**HOLD-DOWN CLIPS**: Provide hold-down clips standard to the manufacturer, at fire-resistance-rated ceiling assemblies.

**MISCELLANEOUS MATERIALS**:

**CONCEALED ACOUSTICAL SEALANT**: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable sealant complying with requirements specified in Division 7 Section "Joint Sealers."

## 3.0 EXECUTION

**EXAMINATION**: Examine substrates and structural system to which ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling system. Do not proceed with installation until unsatisfactory conditions have been corrected.

**PREPARATION**:

**COORDINATION**: Furnish layouts for clips and other ceiling anchors whose installation is specified in other sections.

Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling, unless otherwise indicated. Avoid use of less-than-half-width units at borders, and comply with reflected ceiling plans.

**INSTALLATION**:

**GENERAL**: Install acoustical ceiling systems to comply with installation standard referenced below, per manufacturer's instructions and CISCA "Ceiling Systems Handbook."

**STANDARD FOR INSTALLATION OF CEILING SUSPENSION SYSTEMS**: Comply with ASTM C 636.

Arrange acoustical units and orient directionally patterned units and in manner shown by reflected ceiling plans.

Suspend ceiling hangers from building structural system and as follows:

Install hangers plumb and free from contact with other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

Where width of ducts and other construction within ceiling plenum produces hanger spacings which interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices that are secure and appropriate for substrate, and in a manner that will not cause deterioration or failure due to age, corrosion, or elevated temperatures.

Space hangers not more than 4'-0" o.c. along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8 inches from ends of each member.

Install edge moldings of type indicated or required at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical units. Screw-attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely.

Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations. Install hold-down clips, spaced as recommended by panel manufacturer, unless otherwise indicated or required.

**CLEANING**: Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

## SECTION 09650 - RESILIENT FLOORING

### 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

**DESCRIPTION OF WORK**: Extent of resilient flooring and its accessories is shown on drawings and in schedules.

**QUALITY ASSURANCE**:

**MANUFACTURER**: Provide each type of resilient flooring and its accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

**FIRE TEST PERFORMANCE**: Provide resilient flooring which complies with the following fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.

**FLAME SPREAD**: Not more than 75 per ASTM E 84.

**SMOKE DEVELOPED**: Not more than 450 per ASTM E 84.

**SMOKE DENSITY**: Not more than 450 per ASTM E 662.

**SUBMITTALS**:

**PRODUCT DATA**: Submit manufacturer's technical data for each type of resilient flooring and accessory.

**SAMPLES FOR INITIAL SELECTION PURPOSES**: Submit manufacturer's standard color charts in form of actual sections of resilient flooring, including accessories, showing full range of colors and patterns available, for each type of resilient flooring required.

**SAMPLES FOR VERIFICATION PURPOSES**: Submit the following samples of each type, color, and pattern of resilient flooring required, showing full-range of color and pattern variations.

**MAINTENANCE INSTRUCTIONS**: Submit 2 copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

**PROJECT CONDITIONS**: Maintain minimum temperature of 65 deg. F (18 deg. C) in spaces to receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 55 deg. F (13 deg. C) in areas where work is completed.

Install resilient flooring and its accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture test.

## 2.0 PRODUCTS

**ACCEPTABLE MANUFACTURERS**:

**MANUFACTURER**: Subject to compliance with requirements, provide products of one of the following:

**MANUFACTURERS OF VINYL COMPOSITION TILE**:

Armstrong World Industries, Inc.
Azrock Floor Products Div., Azrock Industries, Inc.
Kentile Floors, Inc.
Tarkett Inc.

**MANUFACTURERS OF VINYL WALL BASE**:

Armstrong World Industries, Inc.
Azrock Floor Products Div., Azrock Industries, Inc.
Flexco Div., Textile Rubber Co.
Johnson Rubber Co., Inc.
Kentile Floors, Inc.
Mercer Plastics Co., Inc.
Vinyl Plastics, Inc.

**RESILIENT FLOORING COLORS AND PATTERNS**: Provide color and patterns as selected by Architect/Engineer from manufacturer's standards.

**TILE FLOORING**:

**VINYL COMPOSITION TILE**: Basis of Design Product: Armstrong Standard Excelon Imperial Texture, subject to compliance with requirements, provide either the named product or comparable product of manufacturers listed. FS SS-T-312, Type IV; 12" x 12" unless otherwise indicated, and as follows:

**COMPOSITION 1**: Asbestos-free.

**GAGE**: 1/8".

**ACCESSORIES**:

**VINYL WALL BASE**: Basis of Design Product: Johnsonite Vinyl Base, subject to compliance with requirements, provide either the named product or comparable product of manufacturers listed. Provide vinyl base complying with FS SS-W-40, Type II, in continuous rolls, and as follows:

**HEIGHT**: 4".

**THICKNESS**: 1/8" gage.

**FINISH**: Matte.

**RESILIENT EDGE STRIPS**: 1/8" thick, homogeneous vinyl composition, tapered or bullnose edge, color to match flooring, as selected by Architect/Engineer from standard colors available; not less than 1" wide.

**ADHESIVES (CEMENTS)**: Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.

**CONCRETE SLAB PRIMER**: Non-staining type as recommended by flooring manufacturer.

**LEVELING AND PATCHING COMPOUNDS**: Latex types as recommended by flooring manufacturer.

## 3.0 EXECUTION

**INSPECTION**: Require Installer to inspect subfloor surfaces to determine that they are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.

Perform bond and moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry as well as to ascertain presence of curing compounds.

Do not allow resilient flooring work to proceed until subfloor surfaces are satisfactory.

**PREPARATION**: Prepare subfloor surfaces as follows:

Use leveling and patching compounds as recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors.

Remove coatings from subfloor surfaces that would prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives, paint, oils, waxes and sealers.

Broom clean or vacuum surfaces to be covered, and inspect subfloor.

Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

**INSTALLATION, GENERAL**: Install resilient flooring using method indicated in strict compliance with manufacturer's printed instructions. Extend resilient flooring into toe spaces, door reveals, and into closets and similar openings.

Scribe, cut, and fit resilient flooring to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.

Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.

Tightly cement resilient flooring to sub-base without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient flooring at perimeter of each covered area to assure adhesion.

**INSTALLATION OF TILE FLOORS**: Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room area of equal width. Adjust as necessary to avoid use of cut widths less than ½ tile at room perimeters. Lay tile square to room axis, unless otherwise shown.

Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable. Lay tile with grain running in one direction.

Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer's directions.

**INSTALLATION OF ACCESSORIES**: Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces. On irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

Apply resilient accessories to stairs as indicated and in strict accord with manufacturer's installation instructions.

**CLEANING AND PROTECTION**: Perform following operations immediately upon completion of resilient flooring:

Sweep or vacuum floor thoroughly.

Do not wash floor until time period recommended by resilient flooring manufacturer has elapsed to allow resilient flooring to become well-sealed in adhesive.

Damp-mop floor being careful to remove black marks and excessive soil.

Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient flooring manufacturers.

Protect flooring against damage during construction period to comply with resilient flooring manufacturer's directions.

**EXTRA STOCK**: Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels. Furnish not less than one box of tile flooring for each type, color, pattern and size installed.

END OF SECTION 09650

# SECTION 09652 - SHEET VINYL FLOOR COVERINGS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes sheet vinyl floor coverings.

B. Related Sections include the following:

1. Division 9 Section "Resilient Flooring" for resilient wall base, reducer strips, and other accessories installed with sheet vinyl floor coverings.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of floor covering indicated.

1. Include similar Samples of installation accessories involving color selection.

C. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections of each different color and pattern of floor covering required.

1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches (230 mm) long, of each color required.

D. Heat-Welded Seam Samples: For each flooring product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch (150-by-230-mm) Sample applied to a rigid backing and prepared by Installer for this Project.

E. Qualification Data: For Installer.

F. Maintenance Data: For floor coverings to include in maintenance manuals.

### 1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project that are competent in heat-welding techniques required by manufacturer for floor covering installation.

1. Engage an installer who employs workers for this Project that are trained or certified by floor covering manufacturer for heat-welding techniques required.

B. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store rolls upright.

## 1.6 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 85 deg F (29 deg C), in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install floor coverings after other finishing operations, including painting, have been completed.

## 1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, in roll form and in full roll width for each color, pattern, and type of floor covering installed.

## PART 2 - PRODUCTS

### 2.1 SHEET VINYL FLOOR COVERING

A. Basis of Design Product: The design for each product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product.

1. Tarkett Inc.; Dignity.

B. Sheet Vinyl Floor Covering With Backing: ASTM F 1303.

1. Type (Binder Content): I, minimum binder content of 90 percent.
2. Wear-Layer Thickness: Grade 1.
3. Overall Thickness: 0.080 gauge (2.0 mm).
4. Backing Class: Class B (nonfoamed plastic).

C. Color and Pattern: As selected by Architect from manufacturer's full range.

D. Wearing Surface: Smooth.

E. Sheet Width: 6.5 feet (1.98 m).

F. Seaming Method: Heat welded.

G. Fire-Test-Response Characteristics:

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

### 2.2 INSTALLATION MATERIALS

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

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

1. Use epoxy adhesives where indicated under patient beds.

a. Commercial two-part epoxy adhesive equal to Armstrong S-230.

C. Heat-Welding Bead: Solid-strand product of floor covering manufacturer.

1. Color: Match floor covering.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of floor coverings.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Moisture Testing:

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install floor coverings until they are same temperature as space where they are to be installed.

F. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. After cleaning, examine substrates for moisture, alkaline salts,

carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.3 INSTALLATION

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

B. Lay out sheet vinyl floor coverings as follows:

1. Maintain uniformity of floor covering direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in floor covering substrates.
3. Match edges of floor coverings for color shading at seams.
4. Avoid cross seams.

C. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

D. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

E. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.

F. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

G. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

## 3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing floor covering installation:

1. Remove adhesive and other blemishes from floor covering surfaces.
2. Sweep and vacuum floor coverings thoroughly.
3. Damp-mop floor coverings to remove marks and soil.

    a. Do not wash floor coverings until after time period recommended by manufacturer.

B. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder

of construction period. Use protection methods recommended in writing by manufacturer.

1. Apply protective floor polish to surfaces that are free from soil, visible adhesive, and blemishes if recommended in writing by manufacturer.
2. Cover floor coverings with undyed, untreated building paper until Substantial Completion.
3. Do not move heavy and sharp objects directly over floor coverings. Place plywood or hardboard panels over floor coverings and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09652

## SECTION 09680 - CARPETING

### 1.0 - GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**SUMMARY**: Extent, location and details of each type of carpeting are indicated on drawings and in schedules.

Work of this section includes furnishing and installation of carpeting, adhesives and accessories.

**SUBMITTALS**:

**PRODUCT DATA**: Submit manufacturer's product literature and installation instructions for each type of carpeting material and installation accessory required. Include methods of installation for each type of substrate. For information only, submit a copy of the manufacturer's specifications, maintenance and installation instructions for accessories required.

Submit written data on physical characteristics, durability, resistance to fading and flame resistance characteristics.

**SHOP DRAWINGS**: Submit shop drawings showing carpet layout and seaming diagrams, clearly indicating carpet direction, and types of edge strips. Indicate doorways, enclosing walls/partitions, built-in cabinets, and locations where cutouts are required in carpet. Show installation details at any special conditions. Architect/Engineer will furnish floor plan sepias for use in preparing carpet layouts.

**SAMPLES FOR VERIFICATION PURPOSES**: Submit the following:

18" square samples of each type of carpet material required.

Prepare samples from same material to be used for the work.

**QUALITY ASSURANCE**:

**INSTALLER QUALIFICATIONS**: Firm specializing in carpet installation with not less than 5 years of experience in installation of carpeting similar to that required for this project. A list of projects showing previous experience will be required.

**SINGLE SOURCE RESPONSIBILITY**: Provide material produced by a single manufacturer for each carpet type.

**DELIVERY, STORAGE, AND HANDLING**: Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, fire hazard classification, and lot number. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity; laid flat, blocked off ground to prevent sagging and warping. Maintain temperature in storage area above 40 degrees Fahrenheit.

Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

**SEQUENCING AND SCHEDULING**: Sequence carpet installation with other work to minimize possibility of damage and soiling during remainder of construction period.

**GUARANTEES**: The flooring contractor shall unconditionally guarantee the carpet installation for a period of two years after substantial completion of the building.

The manufacturers shall further guarantee that all materials shall be of first quality and guaranteed against defects in workmanship and materials.
Any service required to correct either material or installation as outlined in this specification shall be performed by the carpet contractor at no charge for a period of two (2) years from the date of final acceptance by the owner.

**MAINTENANCE**:

**MAINTENANCE INSTRUCTIONS**: Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated traffic and use conditions. Include precautions against materials and methods which may be detrimental to finishes and performance.

**REPLACEMENT MATERIALS**: After completion of work, deliver not less than 30 square yards of full-width carpet of each type, color, and pattern of carpeting plus unused scraps larger than 2 square yards, exclusive of material required to properly complete installation. Furnish accessory components as required. Furnish replacement materials from same production run as materials installed. Package replacement materials with protective covering, identified with appropriate labels.

## 2.0 - PRODUCTS

### CARPET

**BASIS OF DESIGN PRODUCT**: The specified carpet is based on the named product. Subject to compliance with requirements, provide either the named product or a comparable product.

**MANUFACTURER**: J & J Commercial; R & R.

**STYLE**: 2855.

**WIDTH**: 12 feet, (3.66 m).

**YARN**: 100% Nylon: J & J Encore®, SD Ultima®, Bulked Continuous Filament.

**PRIMARY BACKING:** Manufacturer's standard material

**SECONDARY BACKING**: ActionBac® LTP™.

**COLOR**: As selected from manufacturer's full range.

**PATTERNING TECHNIQUE:** TechnoWeave® II.

**PATTERN REPEAT**: As selected from manufacturer's full range.

**DYE METHOD**: Colorloc® Plus - Solution Dye Technology.

**SURFACE TEXTURE**: Patterned Loop.

**GAUGE**: 1/10 (3.94 rows/cm).

**TUFTED STITCHES PER INCH**: 12.3

**YARN WEIGHT**: 28 oz/sy

**FINISHED PILE THICKNESS**: .130 inch (ASTM D-418).

**DENSITY**: 7,754

**WEIGHT DENSITY**: 217,112

**SPECIAL TREATMENTS**: ProTex Fluorochemicals & ProSept Antimicrobial.

**PERFORMANCE CHARACTERISTICS AS FOLLOWS**:

Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
Dry Breaking Strength: Not less than 100 lbf (445 N) per ASTM D 2646.
Resistance to insects: Comply with AATCC-24.
Noise Reduction Coefficient (NRC): per ASTM C 423.
Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC-165.
Colorfastness to Light: Not less than 4 after 40 AFU (AACC fading units) per AATCC-16.
Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC-174.
NBS Smoke Chamber NFPA-258-less than 450 flaming mode.

**MISCELLANEOUS MATERIALS**:

**ADHESIVES**: Provide manufacturer's recommended adhesives, produced expressly for use with selected carpet cushion on substrate as shown on drawings. Provide materials which are mildew resistant.

**ACCESSORIES**:

**TOP SET NOSING**: Mercer No. 610 or pre-approved equal.

**DIVIDER SADDLE**: Mercer No. 502 or pre-approved equal.

**CARPET REDUCER**: Mercer No. 705 or pre-approved equal.

**INSTALLATION ADHESIVE**: Water-resistant, non-staining as recommended by carpet manufacturer, which complies with flammability requirements for installed carpet.

**SEAMING CARPET**: Hot-melt seaming adhesive or similar product recommended by carpet manufacturer, for taping seams and butting cut edges at backing to form secure seams and preventing pile loss at seams.

**MISCELLANEOUS MATERIALS**: As recommended by manufacturers of carpet, cushions, and other carpeting products; selected by Installer to meet project circumstances and requirements.

## 3.0 - EXECUTION

**EXAMINATION**: Examine substrates for moisture content and other conditions under which carpeting is to be installed. Notify contractor in writing of major conditions detrimental to proper completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

**MATERIALS**: All materials shall be firmly and securely bonded to supporting surfaces and cleaned upon completion.

**FINISH SURFACES**: Finish surfaces shall be of true line and plane, without evidence of humps, breaks, sags or other defects.

**PREPARATION**: Repair minor holes, cracks, depressions, and rough areas using material recommended by carpet or adhesive manufacturer.

Clear away debris and scrape up cementitious deposits from surfaces to receive carpeting; vacuum clean immediately before installation. Check concrete surfaces to ensure no dusting through installed carpet; apply sealer where required to prevent dusting.

**INSTALLATION**: Comply with manufacturer's recommendations for seam locations and direction of carpet; maintain uniformity of carpet location and lay of pile. Follow seaming diagram as submitted and approved. At doors, center seams under doors; do not place seams in traffic direction at doorway.

Extend carpet under open-bottomed obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.

Provide cut-outs where required, and bind cut edges properly where not concealed by protective edge guards or overlapping flanges.

Install carpet edge guard where edge of carpet is exposed and anchor guards to substrate.

**EXPANSION JOINTS**: Do not bridge building expansion joints with continuous carpeting; provide for movement.

**GLUE-DOWN INSTALLATION**: Fit sections of carpet into each space prior to application of adhesive. Trim edges and butt cuts with seaming cement.

Apply adhesive uniformly to substrate in accordance with manufacturer's instructions. Butt carpet edges tightly together to form seams without gaps. Roll entire carpet area lightly to eliminate air pockets and ensure uniform bond. Remove any adhesive promptly from face of carpet or from other finishes by method which will not damage carpet or other finish face.

Carpet shall be installed with a minimum of seams, and shall not be laid in strips less than 4'-0" wide (with the exception of areas of fine detail.)

Carpet scraps shall be furnished for use at entries to carpeted spaces for protection of work already completed during the installation period.

Install edge trim at all junctions with other floor finishes, including doors where thresholds do not occur or as detailed on drawings.

Verify with the Architect/Engineer prior to beginning installation, all edging techniques, lines of demarcation between carpeted and hard surfaced floor areas, and treatment at doors and thresholds.

Carpet shall be installed, wall to wall, using continuous lengths and as broad widths as possible to minimize the placement of seams in traffic lanes. Cut edges shall be trued and appropriately treated to form invisible and non-raveling joints where exposed.

Carpet shall be discontinuous through fire-rated doors. Thresholds are supplied in Division 8, Section 08710; their installation should be coordinated to minimize carpet damage.

**CLEANING**: Remove and dispose of debris and unusable scraps. Vacuum carpet using commercial machine with face-beater element. Remove spots and replace carpet where spots cannot be removed. Remove any protruding face yarn using sharp scissors.

**PROTECTION**: Provide protective methods and materials needed to ensure that carpeting will be without deterioration or damage at time of substantial completion.

**RESTRETCHING**: Return to installation after approximately 6 months of occupancy and use; repair faults in seaming, trim and adjust carpeting at edges.

END OF SECTION 09680

## SECTION 09900 - PAINTING

### 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this section.

**SUMMARY**: This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections.

Paint exposed surfaces whether or not colors are designated in "schedules," except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect/Engineer will select from standard colors or finishes available.

**PAINTING NOT INCLUDED**: The following categories of work are not included as part of the field-applied finish work or are included in other sections of these specifications:

**SHOP PRIMING**: Unless otherwise specified, shop priming of ferrous metal items is included under the various sections for structural steel, steel joists, metal fabrications, hollow metal work and similar items; also, for fabricated components such as architectural woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical equipment or accessories.

**PREFINISHED ITEMS**: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) acoustic materials; architectural woodwork; toilet partitions; elevator doors, frames, panels and equipment; finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets except for electrical panels located in an occupied room or corridor.

**CONCEALED SURFACES**: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, pipe spaces and duct shafts.

**FINISHED METAL SURFACES**: Metal surfaces of anodized aluminum, stainless steel, chromium plate, bronze and similar finished materials will not require finish painting, unless otherwise indicated.

**OPERATING PARTS AND LABELS**: Moving parts of operating units and mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices and motor and fan shafts, will not require finish painting, unless otherwise indicated. Do not paint over any Code-required labels, such as Underwriters' Laboratories, Inc. and Factory Mutual, or any equipment identification, performance rating, nameplates or nomenclature plates.

Do not apply paint in rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5 deg F (3 deg C) above the dew point, or to damp or wet surfaces. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

Do not apply paint in areas where dust is being generated and where the illumination is inadequate.

## 2.0 PRODUCTS

**COLORS AND FINISHES**: Paint colors, surface treatments and finishes are indicated in the SCHEDULES of the contract documents. Prior to beginning the work, the Architect/Engineer will furnish color chips for the surfaces to be painted. Use representative colors when preparing samples for review. The final acceptance of colors will be from the samples applied on the job.

**COLOR PIGMENTS**: Use pure, non-fading, applicable types of color pigments, to suit the substrates and the service indicated.

**LEAD CONTENT**: The lead content in the pigment, if any, is limited to contain not more than 0.5% lead, as lead metal, based on the total non-volatile (dry-film) of the paint by weight. This limitation is extended to all interior surfaces and those exterior surfaces which are readily accessible to children under seven years of age.

**PAINT COORDINATION**: Provide finish coats which are compatible with the prime paints used. Review other sections of these specifications in which prime paints are to be provided, to insure the compatibility of the total coatings system for the various substrates. Upon request from other trades, furnish information on the characteristics of the finish materials proposed for use, to insure that compatible prime coats are used. Provide barrier coats over incompatible primers; or remove and reprime as required. Notify the Architect/Engineer, in writing, of any anticipated problems in using the specified coating systems with substrates primed by others.

**MATERIAL QUALITY**: Provide the best quality grade of the various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable. Provide an undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer; and use only within the recommended limits. Use paint materials which will withstand normal washing to remove pencil marks, ink, ordinary soiling, etc. without showing discoloration, loss of gloss, staining or other damage.

**HAZARDOUS PAINTS**: No product shall be used which will present a health hazard to humans when used as intended. Any product not meeting this requirement shall be brought to the Architect/Engineer's attention.

**PROPRIETARY NAMES**: The proprietary names used to designate colors or materials are not intended to imply that the products of the named manufacturers are required to the exclusion of equivalent products of other manufacturers.

**PAINT SYSTEMS**: Use products of the paint manufacturers listed below or pre-approved equal. In some cases numbers may indicate a specific color or white, however numbers are intended to indicate quality only and colors are to be selected after award of contract. The listed manufacturers are referred to as follows:

Basis of Design Product: Sherwin-Williams Paint Co. products where used in Phase 1 Office Building.

| | |
|---|---|
| P | Pittsburgh Paint Co. |
| S-W | Sherwin-Williams Paint Co. |
| D | Devoe/Dulux Paints (ICI Paints) |
| SUN | Suntec Paint Inc. |

**NOTE:** Glidden paint systems are not acceptable.

Provide the following paint systems for the various substrates as indicated:

## EXTERIOR SYSTEMS

**FERROUS METAL: Gloss Alkyd Enamel**

| Coats | SUN | P | S-W | D |
|---|---|---|---|---|
| 1st, shop coat or | 3001 3020 | 6-212 | A11 | 4160 |
| 2nd | 9105 | 6-252 | K34 | 4308 |
| 3rd | 9105 | 6-252 | K34 | 4308 |

**FIBER-CEMENT SIDING AND TRIM: Latex Flat**

| Coats | SUN | P | S-W | D |
|---|---|---|---|---|
| 1st | 8105 | 76 Line | A-100 | 2210 |
| 2nd | 8105 | 76 Line | A-100 | 2210 |

**STAINED WOODWORK: Alkyd or Polyrethane-Based Clear Satin Varnish**

| Coats | SUN | P | S-W | D |
|---|---|---|---|---|
| 1st | N/A | 77-7 | A66 | 1902-000 |
| 2nd | N/A | 77-7 | A66 | 1902-000 |

## 3.0 EXECUTION

**NOTE**: Provide product safety sheets for all paint systems and take proper precautions when applying to prevent odors and oversprays.

**EXAMINATION**: Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected. **Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.**

**SURFACE PREPARATION**:

**GENERAL**: Perform preparation and cleaning procedures in strict accord with the paint manufacturer's instructions and as herein specified, for each particular substrate condition. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures and similar items in place and not to be finish-painted; or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for the complete painting of the items and adjacent surfaces.

Following completion of the painting of each space or area, reinstall the removed items, the work to be done by workmen skilled in the trades involved. Clean the surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to the mechanical cleaning. Program the cleaning and painting so that contaminates from the cleaning process will not fall onto wet, newly-painted surfaces. Spotting-in of rubbed-off places in shop coats shall be done by the trade installing the material, unless otherwise provided, before any field painting is done; and such spotting-in will not be considered as one of the coats specified or called for on the schedules.

**CEMENTITIOUS MATERIALS**: Prepare cementitious surfaces of concrete and concrete block to be painted by removing all efflorescence, chalk, dust, dirt, grease and oils and by roughening as required to remove glaze. Determine the alkalinity and moisture content of the surfaces to be painted by performing the appropriate tests. If the surfaces are found to be sufficiently alkaline to cause blistering and burning of the finish paint, correct this condition before the application of the paint. Do not paint over surfaces where the moisture content exceeds that permitted in the manufacturer's printed directions. If concrete or

concrete masonry contain excessive voids, pits, burrs or uneven surfaces to permit filling with the specified prime or filler coat and to provide a satisfactory finish surface after normal painting trade preparation procedures, then the contractor shall be notified for corrective work before proceeding with the painting.

**WOOD**: Clean wood surfaces to be painted of all dirt, oil or other foreign substances, with scrapers, mineral spirits and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view; and dust off. Scrape and clean small, dry, seasoned knots; and apply a thin coat of white shellac or other recommended knot sealer, before application of the priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sandpaper smooth when dried. Prime edges, ends, faces, undersides and backsides of wood, including cabinets, counters, cases, exterior trim, etc., coming in contact with masonry or concrete, using "Wood Life" as manufactured by U. S. Plywood Co. When a transparent finish is required, use spar varnish for backpriming. Seal tops, bottoms and cutouts of unprimed wood doors with a heavy coat of varnish or an equivalent sealer, immediately upon delivery to the job.

**FERROUS METALS**: Clean ferrous surfaces which are not galvanized or shop-coated of oil, grease, dirt, loose mill scale and other foreign substances, by solvent or mechanical cleaning.

**GALVANIZED SURFACES**: Clean galvanized surfaces free of oil and surface contaminants, with an acceptable non-petroleum-based cleaner.

**MATERIALS PREPARATION**: Mix and prepare painting materials in accord with the manufacturer's directions. Store materials not in actual use in tightly covered containers. Maintain the containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue. Stir materials before application to produce a mixture of uniform density; and stir as required during the application of the materials. Do not stir surface film into the material. Remove the film and lumps and, if necessary, strain the material before using.

**APPLICATION**:

**GENERAL**: Apply paint in accord with the manufacturer's directions and with the following:

Use applicators and techniques best suited for the substrate and the type of material being applied.

Apply additional coats when undercoats or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to insure that all surfaces, including edges, corners, crevices, welds and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.

Paint surfaces behind equipment and cabinets the same as similar exposed surfaces.

Paint the back sides of access panels and removable or hinged covers to match the exposed surfaces.

Paint interior and exterior ferrous metal, except stainless steel.

Finish exterior doors on the tops, bottoms and side edges the same as the exterior faces, unless otherwise indicated.

Sand lightly between each succeeding enamel coat.

Metal work to be concealed upon completion shall be given one field coat in addition to the shop coats, including the back sides of all metal door frames.

Paint prime-coated mechanical equipment, piping and access panels exposed in occupied areas.

Paint equipment room walls and surfaces, unless otherwise scheduled.

Surfaces shall be smooth and free from raised grain or other defects after painting.

Each coat of paint and/or enamel shall be evenly worked out and allowed to dry before any subsequent coat is applied or any rubbing is done, with at least 48 hours' drying time allowed between coats.

Tint each coat a different shade from that of the preceding coat. Finish coats shall be the exact shades selected.

Edges of paint adjoining other materials or other colors shall be full and clean-cut, without overlapping.

Paint exposed piping, covered or uncovered, the same color as adjacent surfaces.

Paint over interior exposed caulking with the color to match the trim of the adjacent wall.

Brush application is required for all enameling of woodwork. Other painting may be applied by spray, rollers or brushes, at the discretion of the painting subcontractor, as long as all the requirements of these specifications are met.

Paint tops, edges and bottoms of all doors.

Omit the 1st coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

**SCHEDULING PAINTING**: Apply the 1st-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting, as soon as practicable after preparation and before subsequent surface deterioration. Allow a sufficient time between successive coatings to permit proper drying. Do not recoat until the paint has dried to feel firm, does not deform or feel sticky under moderate thumb pressure and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat. Repair scratched or rubbed places in final coats before the work is ready for acceptance. Surfaces in areas adjoining special coatings shall be painted after the coating application. Complete painting prior to the installation of the finish flooring.

**MINIMUM COATING THICKNESSES**: Apply each material at not less than the manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated; or, if not indicated, as recommended by the coating manufacturer.

**PIGMENTED (OPAQUE) FINISHES**: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

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

Provide satin fir final coats.
Provide sanding sealer as recommended by varnish manufacturer.

**COMPLETED WORK**: Match approved samples for color, texture and coverage. Remove, refinish or repaint work that is not in compliance with the specified requirements.

**CLEAN-UP AND PROTECTION**:

**CLEAN-UP**: During the progress of the work, remove from the site all discarded paint materials, rubbish, cans and rags, at the end of each work day. Upon completion of the painting work, clean windows glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage the finished surfaces.

**PROTECTION**: Protect the work of other trades, whether to be painted or not, against damage by the painting and finishing work. Correct any damage by cleaning, repairing or replacing and repainting, as acceptable to the Architect/Engineer. Provide WET PAINT signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for the protection of their work, after completion of the painting operations. At the completion of the work of other trades, touch up and restore all damaged or defaced painted surfaces.

END OF SECTION 09900

## SECTION 10150 - MISCELLANEOUS SPECIALTIES

### 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**SUMMARY**: This section covers the furnishing and installing of miscellaneous specialty items. Installation of these items is included under Division-6, unless otherwise noted. These items have no particular relationship to each other or to other branches of the work. This section includes the following item:

Signage.
Corner Guards.
Decorative Columns.

**SHOP DRAWINGS**: Provide shop drawings and/or product data for each item. Show dimensions, layout, construction details and installation details. For each specialty specified, include descriptions of materials, finishes, fastenings and anchoring devices and appurtenances.

**PRODUCT DELIVERY, STORAGE AND HANDLING**: Deliver items cartoned, crated, wrapped or otherwise protected from shipping hazards and ready for installation. Damaged items are to be removed from the site and replaced with new, undamaged items, at no cost to the owner. Store in safe, dry locations and protect from damage during installation.

### 2.0 PRODUCTS

**SIGNAGE**:

**PLASTIC SIGNS**: Provide 1/8" thick plastic signs, with have raised letters and braille lettering. Signs shall comply with all requirements of A.D.A. for text size, style and stroke. Mounting on latch side of door with center of sign at 5' above floor. Colors shall be picked from manufacturer's standards. Provide one sign for each toilet with text "Men" and "Women" and "Unisex" as applicable; include international accessibility symbol: optional separate signs. Provide text as indicated on the Drawings. Provide medical gases signage on door(s) to read as follows: CAUTION Medical Gases No Smoking or Open Flame.

**CORNER GUARD:**

**SURFACE CORNER GUARD**: Provide extruded high impact vinyl acrylic corner guard with pebblette texture and aluminum retainer by manufactured by C/S Group Acrovyn, Model SM-10 (3" legs) for 90° corners, provide appropriate rated for non 90° corners (SM-20M) see Drawings for required angles, or equal. Color to be selected by Architect from manufacturer's full range.

**DECORATIVE COLUMN**:

**WOOD COLUMN**: Provide non-bearing decorative columns for interior use of tongue and groove stave constructed wood columns equal to as manufactured by Crown Column &

Millwork, L.L.C., in circular plan with plain surface equal to Tuscan Cap and Base Design 100-P.

Wood to be paint grade poplar/pine.
Provide appropriate plinth of matching wood.

## 3.0 EXECUTION

**INSTALLATION**: Install all products in accord with manufacturer's published recommendations. Fasten all items to fully develop their strength.

END OF SECTION 10150

# SECTION 10160 - TOILET PARTITIONS

## 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**SUMMARY**: Extent of toilet partitions is indicated on drawings. Type of toilet compartments is plastic laminate finish.

Style of toilet compartments is floor-anchored, overhead braced.

Style of screens, wall-hung.

Toilet accessories, such as toilet paper holders and grab bars are specified elsewhere in Division 10.

**SUBMITTALS**:

**PRODUCT DATA**: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.

**SHOP DRAWINGS**: Submit shop drawings for fabrication and erection of toilet partition assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.

**SAMPLES**: Submit full range of color samples for types of units required. Submit 6" square samples of each color and finish on same substrate to be used in work, for color verification after selections have been made.

**QUALITY ASSURANCE**:

**FIELD MEASUREMENTS**: Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of work. However, allow for adjustments within specified tolerances where ever taking of field measurements before fabrication might delay work.

**COORDINATION**: Furnish inserts and anchorages which must be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.

**GUARANTEE**: Guarantee hardware against corrosion and plating peeling for five years. Guarantee partitions against defects for one year.

## 2.0 PRODUCTS

**MATERIALS**:

**BASIS OF DESIGN PRODUCT**: Comres Manufacturing, subject to compliance with requirement, provide either the named product or comparable product.

**GENERAL**: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.

**PLASTIC LAMINATE**: NEMA Std. LD-3, minimum 0.050" thick, color and pattern as selected by Architect/Engineer from manufacturer's standards.

**CORE MATERIAL FOR PLASTIC LAMINATE**: Solid particleboard core with face laminate fused in fabrication to substrate with no glue line or seam visible. Doors and pilasters minimum 3/4" finished thickness; divider panels minimum ½" finished thickness.

**PILASTER SHOES**: ASTM A 167, Type 302/304 stainless steel, not less than 3" high, 20 gage, finished to match hardware.

**STIRRUP BRACKETS**: Manufacturer's standard design for attaching panels to walls and pilasters, either chromium-plated non-ferrous cast alloy ("Zamac").

**HARDWARE AND ACCESSORIES**: Manufacturer's standard design, heavy-duty operating hardware and accessories of chromium-plated non-ferrous cast alloy ("Zamac").

**OVERHEAD-BRACING**: Continuous extruded aluminum, anti-grip profile, with clear anodized finish.

**ANCHORAGES AND FASTENERS**: Manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.

**FABRICATION**:

**GENERAL**: Furnish standard doors, panels, screens, and pilasters fabricated for partition system, unless otherwise indicated. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated.

**DOORS DIMENSIONS**: Unless otherwise indicated, furnish 24" wide inswinging doors for ordinary toilet stalls and 32" wide (clear opening) outswinging doors at stalls equipped for use by handicapped.

**PLASTIC LAMINATE PARTITIONS AND SCREENS**:

**GENERAL**: Pressure-laminate one-piece face sheets to core material with no splices or joints, and with edges straight and sealed. Seal exposed core material at cutouts to protect against moisture.

**OVERHEAD-BRACED PARTITIONS**: Furnish galvanized steel supports and leveling bolts at pilasters, as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous extruded aluminum anti-grip

overhead-bracing at top of each pilaster. Furnish shoe at each pilaster to conceal supports and leveling mechanism.

**WALL-HUNG SCREEN**: Furnish panel units in sizes indicated, of same construction and finish as partition system panels.

**HARDWARE**: Furnish hardware for each compartment in partition system, as follows:

**HINGES**: Cutout inset type, adjustable to hold door open at any angle up to 90 degrees. Provide gravity type, spring-action cam type, or concealed torsion rod type, to suit manufacturer's standards.

**LATCH AND KEEPER**: Manufacturer's standard surface-mounted latch unit, designed for emergency access, with combination rubber-faced door strike and keeper.

**COAT HOOK**: Manufacturer's standard unit, combination hook and rubber-tipped bumper, sized to prevent door hitting mounted accessories.

**DOOR PULL**: Manufacturer's standard unit for out-swing doors.

## 3.0 EXECUTION

**INSTALLATION**:

**GENERAL**: Comply with manufacturer's recommended procedures and installation sequence. Install partitions rigid, straight, plumb, and level. Provide clearances of not more than ½" between pilasters and panels, and not more than 1" between panels and walls. Secure panels to walls with not less than two stirrup brackets attached near top and bottom of panel. Locate wall brackets so that holes for wall anchorages occur in masonry or tile joints or in firm blocking within steel stud walls. Secure panels to pilasters with not less than two stirrup brackets located to align with stirrup brackets at wall. Secure panels in position with manufacturer's recommended anchoring devices.

**OVERHEAD-BRACED PARTITIONS**: Secure pilasters to floor and level, plumb, and tighten installation with devices furnished. Secure overhead-brace to each pilaster with not less than two fasteners. Hang doors and adjust so that tops of doors are parallel with overhead-brace when doors are in closed position.

**SCREENS**: Attach with concealed anchoring devices, as recommended by manufacturer to suit supporting structure. Set units to provide support and to resist lateral impact.

**ADJUST AND CLEAN**:

**HARDWARE ADJUSTMENT**: Adjust and lubricate hardware for proper operation. Set hinges on inswinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return to fully closed position.

D. Finish Samples for Verification: For each finished material used for flagpoles and accessories.

E. Qualification Data: For professional engineer.

### 1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each flagpole as a complete unit, including fittings, accessories, bases, and anchorage devices, from a single manufacturer.

1. Obtain flagpoles through one source from a single manufacturer.

### 1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Basis-of-Design Product: The design for each flagpole is based on the product specified, subject to compliance with requirements; provide either the named product below or a comparable product.

1. Pole-Tech Company Inc.

### 2.2 FLAGPOLES

A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. For tapered flagpoles, provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

B. Exposed Height: 25 feet (7.6 m).

C. Aluminum Flagpoles: Provide cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/ (B 241M), Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm). Heat treat after fabrication to comply with ASTM B 597, Temper T6.

D. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.

1. Provide flashing collar of same material and finish as flagpole.

## 2.3 FITTINGS

A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. 0.063-inch (1.6-mm) spun aluminum, with gold anodic finish.

B. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16-inch- (8-mm-) diameter, braided polypropylene halyard and 9-inch (228-mm) cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.

1. Provide two halyards and two cleats at each flagpole.

C. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per halyard.

1. Provide with neoprene or vinyl covers.

## 2.4 MISCELLANEOUS MATERIALS

A. Concrete: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa, unless otherwise indicated.)

B. Sand: ASTM C 33, fine aggregate.

C. Elastomeric Joint Sealant: Single-component neutral-curing silicone joint sealant complying with requirements in Division 7 Section "Joint Sealants" for Use NT (nontraffic) and for Use M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

## 2.5 FINISHES

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

B. Aluminum: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

a. Natural Stain Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms and foundation tube, sleeve, or anchor bolts in position, to prevent displacement during concreting.

D. Place concrete immediately after mixing. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use nonstaining curing compound.

E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

### 3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

B. Foundation-Tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Plumb flagpole and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 10350

# SECTION 10522 - FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

## 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**DESCRIPTION OF WORK**: Extent of fire extinguishers, cabinets and accessories is indicated on drawings.

**DEFINITION**: "Fire extinguishers" as used in this section refers to units which can be hand-carried as opposed to those which are equipped with wheels or to fixed fire extinguishing systems.

Types of products required include:

Fire extinguishers.

Fire extinguisher cabinets.

Mounting brackets in cabinets.

Fire sprinkler protection system is specified in Division-15 section.

**QUALITY ASSURANCE**:

**UL-LISTED PRODUCTS**: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating and classification of extinguishers indicated.

**PRODUCT DATA**: Submit product data for each type of product included in this section. For fire extinguisher cabinets include roughing-in dimensions and details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, and panel style and materials.

## 2.0 PRODUCTS

**FIRE EXTINGUISHERS**: MP5 fire extinguishers by Larsen, 5-lb. multi-purpose dry chemical with UL rating 2A-10B-C. Provide standard wall mounting bracket unless already included, such as in a cabinet.

**FIRE EXTINGUISHER CABINETS**: Larsen's Manufacturing Company's 2409-5R, solid door, "FIRE" handle (white), or pre-approved equal, semi-recessed, painted steel cabinet with solid door and die-cast handle with raised lettering "FIRE"; cabinet shall be nominal 29" H x 9-1/2" W x 5" D and project out of wall 1-1/2" with square trim. Cabinets to receive field paint in color to be selected by Architect/Engineer.

**FACTORY FINISHING OF FIRE EXTINGUISHER CABINETS**:

**GENERAL**: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations except as otherwise indicated. Apply finish in factory after products are assembled. Protect cabinets with plastic or paper covering, prior to shipment.

**FIELD-PAINTABLE FACTORY FINISH**: Immediately after cleaning and pretreatment, apply to interior and exterior surfaces, manufacturer's standard factory-applied paint system which is suitable, after deglossing, as an undercoat for field-applied paint system specified in Division-9 Section "Painting."

## 3.0 EXECUTION

**INSTALLATION**: Install items included in this section in locations and at mounting heights required by Americans with Disabilities Act.

Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

Securely fasten fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.

END OF SECTION 10522

## SECTION 10652 - FOLDING PANEL PARTITIONS

### 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**SUMMARY**: This Section includes manually operated, acoustically rated folding panel partitions as indicated and specified herein.

**SUBMITTALS**: Product data on physical characteristics, durability, resistance to fading, and flame spread characteristics for folding panel partitions and accessories specified and required.

**SHOP DRAWINGS**: Show location and extent of folding panel partitions. Include plans, elevations, large-scale details of anchorages, and accessory items. Indicate unit conditions at openings, typical and special details, and location and installation requirements for hardware and operators. Indicate direction of travel and static and dynamic loading on the building structure.

**TEMPLATE DRAWINGS**: Manufacturer shall prepare and furnish showing location of items supported or anchored by permanent construction.

**SAMPLES**: Submit in form of manufacturer's standard color charts showing full range of colors, textures, and patterns available for each type of material exposed to view.

**PRODUCT CERTIFICATES**: Submit certificates signed by manufacturer of folding panel partitions certifying that products comply with specified requirements.

**ACOUSTICAL CERTIFICATION**: Submit certification from an independent testing agency stating that products and materials furnished comply with specified requirements. Include certified laboratory testing data indicating that panels and materials meet specified test requirements. Include STC and NRC ratings and square foot weight of panel.

**SYSTEM PERFORMANCE REQUIREMENTS**:

**FIRE PERFORMANCE CHARACTERISTICS**: Provide folding panel partitions with surface burning characteristics indicated below, as determined by testing assembled materials composed of surface coverings, backings, and other construction identical to those required in this section, per ASTM E 84, by a testing organization acceptable to authorities having jurisdiction.

**FLAME SPREAD**: 25 or less.

**SMOKE DEVELOPED**: 450 or less.

**ACOUSTICAL PERFORMANCE**: Provide folding panel partitions tested by independent testing laboratory acceptable to authorities having jurisdiction, for the following acoustic properties, according to the test method indicated:

**SOUND TRANSMISSION REQUIREMENTS**: Folding panel partition assembly tested in a full-scale opening (14 feet by 9 feet) for laboratory sound transmission loss performance in accord with ASTM E 90, determined by ASTM E 413 and rated for a STC not less than 38.

**QUALITY ASSURANCE**:

**SINGLE-SOURCE RESPONSIBILITY**: Obtain folding panel partitions and mounting hardware from one source from a single manufacturer.

**TESTING LABORATORY QUALIFICATIONS**: To qualify for acceptance, an independent testing laboratory must demonstrate to Architect/Engineer's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, its experience and capability to conduct satisfactorily the testing indicated.

**DELIVERY, STORAGE, AND HANDLING**: Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, fire performance characteristics, and lot number.

Store panels only on edge, blocked off ground to prevent sagging and warping, in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

## 2.0 PRODUCTS

**BASIS OF DESIGN**: Modernfold, Inc.'s Model Acousti-Seal 932FS (paired panel, floor supported).

**OTHER MANUFACTURERS**: Subject to compliance with requirements, Contractor may provide products by one of the following or pre-approved equal:

Hufcor, Inc. (Hough Mfg. Corp.)

**PANEL CONSTRUCTION**: Shall be a nominal 3.25" thick in manufacturer's standard width (48" max.). All panel finishes and construction shall have the fire performance characteristics specified. Panel skins shall be both tackable and moisture resistant. Non-moisture resistant material will not be accepted. Trim design shall not require or permit vertical trim on panel faces and shall, with astragal seals, provide a minimal "groove" appearance at vertical joints.

**PANEL FINISH**: Shall be factory applied, Class "A" rated material, reinforced, heavy duty, vinyl with woven backing weighing not less than 27 ounces per lineal yard.

**SEALS**: Vertical interlocking sound seals between panels (astragal) shall be a reversible tongue and groove configuration and shall be required in each panel edge, permitting universal panel operation. Asragals shall be steel for maximum durability and fire resistance. Rigid plastic astragals or astragals in only one panel edge are not acceptable.

Horizontal top and bottom seals shall be continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion and no mechanically operated parts.

**SUSPENSION SYSTEM**: Floor Track shall consist of a minimum 16-gauge stainless steel. Track shall, on individual panel units, accommodate angular turns and intersections. All track intersections shall be welded for extra strength. Recessed floor track shall require a kerf no wider than 1-inch (25 mm) nor deeper than 1-inch (25 mm).

Each panel (except hinged pairs), shall be supported by one all-steel trolley with steel tired ball-bearing wheels, capable of adjustment with the partition in its extended position. Non-steel tires are not acceptable.

Lateral support shall be provided at the panel top by a steel ceiling guide, which may be either direct mounted to a wood header or supported by pairs of threaded rods, see Drawings. Ceiling guide must be configured to provide support for ceiling tiles. The ceiling guide trolley shall allow up to 0.50-inch (13 mm) of floor deflection without transfer of weight to the ceiling guide.

**PASS DOORS**: Built into panels where indicated pass doors of same basic design, materials, and thickness as panel construction; equipped with sound gaskets at entire perimeter of door. Hinges' finish shall match other exposed hardware. Size to be 3'-0" x 6'-8".

## 3.0 EXECUTION

**EXAMINATION**: Examine flooring for compliance with requirements for installation tolerances and other conditions affecting performance of folding partitions. Do not proceed with installation until unsatisfactory conditions have been corrected.

**INSTALLATION**: Install folding panel partitions and accessories in compliance with ASTM E 557 after other finishing operations including painting, have been completed.

Installation shall be by an authorized factory trained installer.

Install folding panel partitions in conformance with drawings and approved shop drawings and in strict compliance with manufacturer's written installation instructions.

Match folding panel partitions for color and pattern by installing partitions from cartons in same sequence as manufactured and packaged, if so numbered. Broken, cracked, chipped, or deformed partitions are not acceptable.

Repair or replace folding panel partitions within areas where test results indicate partitions do not comply with requirements and retest partitions.

**ADJUSTING**: Lubricate bearings and sliding parts; adjust to ensure smooth, easy operation.

**CLEANING**: Clean all folding partition surfaces and clean adjacent surfaces soiled by work of this section. Avoid use of abrasive cleaners or solutions containing corrosive solvents. Use cleaning materials recommended by manufacturer.

END OF SECTION 10652

# SECTION 10800 - TOILET ACCESSORIES

## 1.0 GENERAL

**RELATED DOCUMENTS**: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**SUMMARY**: This Section includes the following toilet accessory items:

Combination paper towel dispenser & trash receptor

Toilet tissue dispenser.

Grab bar.

Sanitary napkin disposal unit.

Soap dispenser.

Stainless steel framed mirror.

Tumbler and toothbrush holder.

**SUBMITTALS**:

**GENERAL**: Submit product data for each toilet accessory item specified, including details of construction relative to materials, dimensions, gages, profiles, method of mounting, specified options, and finishes in accordance with Conditions of Contract and Division 1 Specifications Sections.

**PRODUCT DELIVERY, STORAGE AND HANDLING**: Deliver items cartoned, crated, wrapped or otherwise protected from shipping hazards. Damaged items are to be removed from the site and replaced with new, undamaged items, at no cost to the Owner.

**QUALITY ASSURANCE**:

**INSERTS AND ANCHORAGES**: Furnish inserts and anchoring devices that must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

**SINGLE-SOURCE RESPONSIBILITY**: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect/Engineer.

**COORDINATION**: Coordinate accessory locations, installation, and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

**SPECIAL PROJECT WARRANTY**: Provide manufacturer's written 5-year warranty against silver spoilage of mirrors, agreeing to replace any mirrors that develop visible defects within warranty period.

## 2.0 PRODUCTS

**MATERIALS, GENERAL**:

**GALVANIZED STEEL MOUNTING DEVICES**: ASTM A 153, hot-dip galvanized after fabrication.

**FASTENERS**: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

**KEYS**: Unless otherwise indicated, provide universal keys for access to toilet accessory units requiring internal access for servicing and resupply. Provide minimum of six (6) keys to Owner's representative and obtain receipt.

**ACCESSORIES**: Bradley Corporation, or pre-approved equal:

| | |
|---|---|
| Combination paper towel dispenser & trash receptor (semi-recessed) | 225-10 |
| Toilet tissue dispenser (surface mount - double roll) | 5241 |
| Grab bar | 812.001-2 |
| Sanitary napkin disposal unit (surface mount) | 4781-15 |
| Soap dispenser (surface mount) | 6542 |
| Mirror (24" x 36") | 781 |
| Tumbler and toothbrush holder | 9044 |

## 3.0 EXECUTION

**INSTALLATION**: Surfaces of fastening devices exposed after installation shall have the same finish as the attached accessory. Exposed screw heads shall be oval. Installed location and height of accessories as directed by Owner. Protect exposed surfaces of accessories with strippable plastic or by other approved means until the installation is accepted. Coordinate accessory manufacturer's mounting details with other trades as their work progresses. After installation, thoroughly clean exposed surfaces and restore damaged work to its original condition or replace with new work.

Install surface-mounted accessories on concealed backplates, except where specified otherwise or required by manufacturer. Accessories without backplates shall have concealed fasteners. Except as indicated or required otherwise, install accessories with sheet metal screws, expansion shields or with toggle bolts or other approved fasteners as required by the construction and the manufacturer. Install backplates in the same manner.

Fasten all accessories mounted on gypsumboard walls without solid backing into the metal studs or to metal backplates secured to metal studs.

Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, in accord with manufacturer's instructions for type of substrate involved.

**ADJUSTING AND CLEANING**: Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

Clean and polish all exposed surfaces in strict accord with manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 10800

# SECTION 11400 - FOODSERVICE EQUIPMENT

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes equipment for foodservice facilities indicated on the Drawings.

B. Owner-Furnished Equipment: Where indicated, Owner will furnish equipment items.

C. Related Sections include the following:

1. Division 6 Section "Finish Carpentry" for custom casework and countertops.
2. Division 15 Sections for supply and exhaust fans; exhaust ductwork; service roughing-ins; drain traps; atmospheric vents; valves, pipes, and fittings; fire-extinguishing systems; and other materials required to complete foodservice equipment installation.
3. Division 15 Section "Cooking Hood Packaged System" for ventilation hoods.
4. Division 16 Sections for connections to fire alarm systems, wiring, disconnect switches, and other electrical materials required to complete foodservice equipment installation.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Manufacturer's model number.
2. Options, accessories, and components that will be included for Project.
3. Clearance requirements for access and maintenance.
4. Utility service connections for water, drainage, power, and fuel; include roughing-in dimensions.

B. Shop Drawings: For fabricated equipment. Include plans, elevations, sections, roughing-in dimensions, fabrication details, utility service requirements, and attachments to other work.

C. Coordination Drawings: For foodservice facilities.

1. Indicate locations of foodservice equipment and connections to utilities.
2. Key equipment using same designations as indicated on Drawings.

3. Include plans and elevations; clearance requirements for equipment access and maintenance; details of support for equipment; and utility service characteristics.

D. Operation and Maintenance Data: For foodservice equipment to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Project Closeout," include the following:

1. Product Schedule: For each foodservice equipment item, include the following:

a. Designation indicated on Drawings.
b. Manufacturer's name and model number.
c. List of factory-authorized service agencies including their addresses and telephone numbers.

E. Warranty: Special warranty specified in this Section.

## 1.4 QUALITY ASSURANCE

A. NSF Standards: Provide equipment that bears NSF Certification Mark or UL Classification Mark certifying compliance with applicable NSF/ANSI standards.

B. UL Certification: Provide electric and fuel-burning equipment and components that are evaluated by UL for fire, electric shock, and casualty hazards according to applicable safety standards and that are UL certified for compliance and labeled for intended use.

C. Regulatory Requirements: Install equipment to comply with the following:

1. ASHRAE 15, "Safety Code for Mechanical Refrigeration."
2. NFPA 54, "National Fuel Gas Code."
3. NFPA 70, "National Electrical Code."
4. NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations."

## 1.5 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Coordination Drawings.

## 1.6 COORDINATION

A. Coordinate foodservice equipment layout and installation with other work, including lighting fixtures, HVAC equipment, and fire-suppression system components.

B. Coordinate location and requirements of utility service connections.

C. Coordinate size, location, and requirements of the following:

1. Overhead equipment supports.

2. Equipment bases.
3. Floor areas with positive slopes to drains.
4. Floor sinks and drains serving foodservice equipment.
5. Roof curbs, equipment supports, and penetrations.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Basis-of-Design Product: The design for foodservice equipment item is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product.

### 2.2 FABRICATED EQUIPMENT

A. Materials:

1. Stainless Steel: ASTM A 666, with No. 4 finish (directional satin finish) on exposed surfaces.

B. Stainless-Steel Sink: K-14

1. Basis-of-Design Product: Eagle Group; Model 314-18-3-24 or a comparable product.
2. Description: Three-compartment sink.
3. Construction: Welded stainless steel, sound deadened.
    a. Bowls: Stainless steel, Type 304, 0.0781-inch (2.0-mm) specified thickness.
    b. Integral Drainboards: Stainless steel, Type 304, 0.0781-inch (2.0-mm) specified thickness.
    c. Body: Stainless steel, Type 304, 0.0781-inch (2.0-mm) specified thickness.
4. Splash:
    a. Back: Manufacturer's standard height.
    b. Side: Manufacturer's standard height.
5. Legs and Feet: Stainless-steel tubing legs with adjustable bullet feet.
6. Options and Accessories:
    a. Faucets and Spouts: T & S Extra Heavy Duty, #313293.
    b. Prerinse Faucet: T & S, B-0133.
    c. Add-on Faucet: T & S, B-0156.
    d. Sink Mixing Faucet with Swing Nozzle: T & S, #B230.
    e. Basket strainer.
    f. Continuous waste.

C. Stainless-Steel Hand Sink: K-11.

1. Basis-of-Design Product: Eagle Group, Model SR10-14-9.5-2 or a comparable product.
2. Description: Two-compartment drop-in sink.
3. Material: Stainless steel, Type 304, 0.0500-inch (1.3-mm) specified thickness.
4. Operation: Handle.
5. Faucet and Spout: T & S, Model 301248.
6. Options and Accessories:

a. Chrome-plated tail piece and P trap, NPS 1-1/2 (DN 40), with 0.045-inch (1.1-mm) minimum wall thickness.
b. Strainer basket with metal post.

## 2.3 COOKING EQUIPMENT

A. Range: K-7.

1. Basis-of-Design Product: Vulcan; 60FL-563 Series or a comparable product.
2. Top Configuration:

a. Open-Burner Unit:

1) Standard Burners: Six.

b. Griddle: Flat, 24".

3. Base Configuration:

a. Standard Ovens: Two.

4. Electrical Service: Equip unit for connection to service indicated on Drawings.
5. Gas Service: Liquefied propane gas.

B. Steamer: K-6.

1. Basis-of-Design Product: Delfield; Steam Table, Model 8745 or a comparable product.
2. Description: Three-compartment electric steam table, drop-in countertop.
3. Options and Accessories:

a. Stainless-steel tanks.
b. Individual electric food wells.
c. Removal covers (3).
d. Drain and manifold for water supply.

4. Electrical Service: Equip unit for connection to service indicated on Drawings.

C. Microwave Oven: K-2.

1. Basis-of-Design Product: Sharp; R-21JV Commercial Microwave Oven, or a comparable product.
2. Description: 1000-W cooking power.
3. Electrical Service: Equip unit with plug and cord for 120-V service.

## 2.4 SELF-CONTAINED REFRIGERATION EQUIPMENT

A. Refrigerator: K-4.

1. Basis-of-Design Product: True Food Service Equipment, Inc.; TS-49G, or a comparable product.

2. Description: Reach-in type.

   a. Exterior Finish: Stainless steel.
   b. Interior Finish: Stainless steel.
   c. Doors: Full length.

3. Options and Accessories:

   a. Casters with brakes.
   b. Stainless-steel back with rear louvers.
   c. Triple pane thermal insulated glass doors.
   d. Hinged glass doors and fluorescent fixtures.
   e. Door locks, keyed alike.
   f. Chrome-Plated Shelves: three per section, plus three extra.
   g. Glass condensate pan.
   h. Evaporator: Epoxy coated at time of manufacture.

4. Electrical Service: Equip unit with plug and cord for service indicated on Drawings.

B. Freezer: K-3.

1. Basis-of-Design Product: True Food Service Equipment, Inc.; TS-49F, or a comparable product.
2. Description: Reach-in-type.

   a. Exterior Finish: Stainless steel.
   b. Interior Finish: Stainless steel.
   c. Doors: Full length.

3. Options and Accessories: Revise list below to suit Project.

   a. Casters with brakes.
   b. Stainless-steel back with rear louvers.
   c. Door locks, keyed alike.
   d. Hinged solid doors and incandescent lighting.
   e. Shelves: Three chrome plated per section.
   f. Standard floor rack and backguard.
   g. Evaporator: Epoxy coated at time of manufacture.

4. Electrical Service: Equip unit with plug and cord for service indicated on Drawings.

C. Ice-Making Machine: K-8.

1. Basis-of-Design Product: Manitowoc; Q-Model Series 320 Ice Cube Machine with QPA-160 Ice Dispenser or a comparable product.

a. Description: Freestanding unit.
b. Production: Ice cubes, half dice.
c. Capacity: 120 lbs (54 kgs) storage.

2. Options and Accessories:

a. Stainless-steel stand and legs.
b. Water filter.
c. Push for ice dispenser.

3. Electrical Service: Equip unit for connection to service indicated on Drawings.

D. Beverage Cooler: K-5

1. Basis-of-Design Product: True; GDM-12 (left-hand swing), or a comparable product.

a. Description: Reach-in type.
b. Door: Full Length.
c. Capacity: 12 cu. ft.

2. Options and Accessories:

a. Door: triple pane thermal glass and positive seal self-closing door.
b. Temperatures: 32° - 38° F.
c. 3 white vinyl shelves.
d. Foamed-in-place polyurethane high-density cell insulation – CFC free.
e. Fluorescent interior lights.
f. Self-contained refrigeration system
g. Bottom mount compressor.
h. R134A refrigerant.
i. Stainless steel floor.

3. Electrical Service: Equip unit for connection to service indicated on Drawings.

## 2.5 WAREWASHING EQUIPMENT

A. Warewashing Machine: K-1.

1. Basis-of-Design Product: Jackson; TempStar, or a comparable product.

a. Upright.

2. Description: Dishwashing, wash tank 8 gallons.

a. Capacity: 57 racks per hour.

3. Options and Accessories:

a. Hot water sanitation.
b. Detergent and rinse additive signal connection fuse.
c. Delime notification/cycle, manual switch.
d. Fresh water – 52.2 gallons per hour.
e. Flow pressure 15-25 psi.
f. Auto-fill.
g. Auto-start.
h. Hi-limit thermostat and low water protection.
i. Steam Flow Pressure: 15-20 psig.
j. Steam consumption at 15 psig: 45 lbs/hr.
k. Electric tank heater.
l. Pump Capacity: 150 GPM.

4. Electrical Service: Equip unit for connection to service indicated on Drawings.

## 2.6 MISCELLANEOUS MATERIALS

A. Installation Accessories, General: NSF certified for end-use application indicated.

B. Elastomeric Joint Sealant: ASTM C 920; Type S (single component), Grade NS (nonsag), Class 25, Use NT (nontraffic) related to exposure, and Use M, G, A, or O as applicable to joint substrates indicated.

1. Public Health and Safety Requirements:

a. Sealant is certified for compliance with NSF standards for end-use application indicated.
b. Washed and cured sealant complies with the FDA's regulations for use in areas that come in contact with food.

2. Cylindrical Sealant Backing: ASTM C 1330, Type C, closed-cell polyethylene, in diameter larger than joint width.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install foodservice equipment level and plumb, according to manufacturer's written instructions.

1. Connect equipment to utilities.
2. Provide cutouts in equipment, neatly formed, where required to run service lines through equipment to make final connections.

B. Complete equipment assembly where field assembly is required.

1. Provide closed butt and contact joints that do not require a filler.
2. Grind field welds on stainless-steel equipment smooth, and polish to match adjacent finish.

C. Install equipment with access and maintenance clearances that comply with manufacturer's written installation instructions and requirements of authorities having jurisdiction.

D. Install closure-trim strips and similar items requiring fasteners in a bed of sealant.

E. Install joint sealant in joints between equipment and abutting surfaces with continuous joint backing, unless otherwise indicated. Produce airtight, watertight, vermin-proof, sanitary joints.

## 3.2 CLEANING AND PROTECTING

A. After completing installation of equipment, repair damaged finishes.

B. Clean and adjust equipment as required to produce ready-for-use condition.

C. Protect equipment from damage during remainder of the construction period.

END OF SECTION 11400

# SECTION 15005/MECHANICAL GENERAL

## 1 GENERAL

1.1 The work covered by this division consists of providing all labor, equipment and materials and performing all operations necessary for the installation of the mechanical work as herein called for and shown on the drawings.

1.2 Related Documents:

1.2.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2.2 This is a Basic Mechanical Requirements Section. Provisions of this section apply to work of all Division 15 sections.

1.2.3 Review all other contract documents to be aware of conditions affecting work herein.

1.2.4 Definitions:

1.2.4.1 Provide: Furnish and install, complete and ready for intended use.

1.2.4.2 Furnish: Supply and deliver to project site, ready for subsequent requirements.

1.2.4.3 Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

1.3 Permits and Fees: Contractor shall obtain all necessary permits, meters, and inspections required for his work and pay all fees and charges incidental thereto.

1.4 Verification of Owner's Data: Prior to commencing any work the Contractor shall satisfy himself as to the accuracy of all data as indicated in these plans and specifications and/or as provided by the Owner. Should the Contractor discover any inaccuracies, errors, or omissions in the data, he shall immediately notify the Architect/Engineer in order that proper adjustments can be anticipated and ordered. Commencement by the Contractor of any work shall be held as an acceptance of the data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions or inaccuracies of the said data.

1.5 Delivery and Storage of Materials: Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. All material shall be stored to provide protection from the weather and accidental damage.

1.6 Extent of work is indicated by the drawings, schedules, and the requirements of the specifications. Singular references shall not be constructed as requiring only one device if multiple devices are shown on the drawings or are required for proper system operation.

1.7 Field Measurements and Coordination:

1.7.1 The intent of the drawings and specifications is to obtain a complete and satisfactory installation. Separate divisional drawings and specifications shall not relieve the Contractor or subcontractors from full compliance of work of his trade indicated on any of the drawings or in any section of the specifications.

1.7.2 Verify all field dimensions and locations of equipment to insure close, neat fit with other trades' work. Make use of all contract documents and approved shop drawings to verify exact dimension and locations.

1.7.3 Coordinate work in this division with all other trades in proper sequence to insure that the total work is completed within contract time schedule and with a minimum cutting and patching.

1.7.4 Locate all apparatus symmetrical with architectural elements. Install to exact height and locations when shown on architectural drawings. When locations are shown only on mechanical drawings, be guided by architectural details and conditions existing at job and correlate this work with that of others.

1.7.5 Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings and passageways. Cut no structural members without written approval.

1.7.6 Carefully examine any existing conditions, piping, and premises. Compare drawings with existing conditions. Report any observed discrepancies. It shall be the Contractor's responsibility to properly coordinate the work and to identify problems in a timely manner. Written instructions will be issued to resolve discrepancies.

1.7.7 Because of the small scale of the drawings, it is not possible to indicate all offsets and fittings or to locate every accessory. Drawings are essentially diagrammatic. Study carefully the sizes and locations of structural members, wall and partition locations, trusses, and room dimensions and take actual measurements on the job. Locate piping, ductwork, equipment and accessories with sufficient space for installing and servicing. Contractor is responsible for accuracy of his measurements and for coordination with all trades. Contractor shall not order materials or perform work without such verification. No extra compensation will be allowed because field measurements vary from the dimensions on the drawings. If field measurements show that equipment or piping cannot be fitted, the Architect/Engineer shall be consulted. Remove and relocate, without additional compensation, any item that is installed and is later found to encroach on space assigned to another use.

1.8 Guarantee:

1.8.1 The Contractor shall guarantee labor, materials and equipment for a period of one (1) year from Substantial Completion, or from Owner's occupancy, whichever is earlier. Contractor shall make good any defects and shall include all necessary adjustments to and replacement of defective items without expense to the Owner.

1.8.2 Owner reserves right to make emergency repairs as required to keep equipment in operation without voiding Contractor's Guarantee Bond nor relieving Contractor of his responsibilities during guarantee period.

1.9 Approval Submittals:

1.9.1 When approved, the submittal control log and submittals shall be an addition to the specifications herewith, and shall be of equal force in that no deviation will be permitted except with the approval of the Architect/Engineer.

1.9.1.1 Shop drawings, product literature, and other approval submittals will only be reviewed if they are submitted in full accordance with the General and Supplementary Conditions and Division 1 Specification sections and the following.

1.9.1.1.1 Submittals shall be properly organized in accordance with the approved submittal control log.

1.9.1.1.2 Submittals shall not include items from more than one specification section in the same submittal package unless approved in the submittal control log.

1.9.1.1.3 Submittals shall be properly identified by a cover sheet showing the project name, Architect and Engineer names, submittal control number, specification section, a list of products or item names with model numbers in the order they appear in the package, and spaces for approval stamps. A sample cover sheet is included at the end of this section.

1.9.1.1.4 Submittals shall have been reviewed and approved by the General Contractor (or Prime Contractor). Evidence of this review and approval shall be an "Approved" stamp with a signature and date on the cover sheet.

1.9.1.1.5 Submittals that include a series of fixtures or devices (such as plumbing fixtures or valves) shall be organized by the fixture number or valve type and be marked accordingly. Each fixture must include all items associated with that fixture regardless of whether or not those items are used on other fixtures.

1.9.1.1.6 The electrical design shown on the drawings supports the mechanical equipment basis of design specifications at the time of design. If mechanical equipment is submitted with different electrical requirements, it is the responsibility of the mechanical contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the mechanical submittal with a written statement that this change will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

1.9.2 If the shop drawings show variation from the requirements of contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in writing in his letter of transmittal and on the submittal cover sheet in

order that, if acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the contract.

1.9.3 Review of shop drawings, product literature, catalog data, or schedules shall not relieve the Contractor from responsibility for deviations from contract drawings or specifications, unless he has in writing called to the attention of the Architect/Engineer each such deviation in writing at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings, product literature, catalog data, or schedules. Any feature or function specified but not mentioned in the submittal shall be assumed to be included per the specification.

1.9.4 Submit shop drawings as called for in other sections after award of the contract and before any material is ordered or fabricated. Shop drawings shall consist of plans, sections, elevations and details to scale (not smaller than ¼" per foot), with dimensions clearly showing the installation. Direct copies of small scale project drawings issued to the Contractor are not acceptable. Drawings shall take into account equipment furnished under other sections and shall show space allotted for it. Include construction details and materials.

1.10 Test Reports and Verification Submittals: Submit test reports, certifications and verification letters as called for in other sections. Contractor shall coordinate the required testing and documentation of system performance such that sufficient time exists to prepare the reports, submit the reports, review the reports and take corrective action within the scheduled contract time.

1.11 O&M Data Submittals: Submit Operation and Maintenance data as called for in other sections. When a copy of approval submittals is included in the O&M Manual, only the final "Approved" or "Approved as Noted" copy shall be used. Contractor shall organize these data in the O&M Manuals tabbed by specification number. Prepare O&M Manuals as required by Division 1 and as described herein.. Submit manuals at the Substantial Completion inspection.

2 PRODUCTS

2.1 All materials shall be new or Owner-supplied reused as shown on the drawings, the best of their respective kinds, suitable for the conditions and duties imposed on them at the building and shall be of reputable manufacturers. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following sections.

2.2 Equipment and Materials:

2.2.1 Shall be new and the most suitable grade for the purpose intended. Equipment furnished under this division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar units or equipment.

2.2.2 Each item of equipment shall bear a name plate showing the manufacturer's name, trade name, model number, serial number, ratings and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated or painted.

2.2.3 The label of the approving agency, such as UL, IBR, ASME, ARI, AMCA, by which a standard has been established for the particular item shall be in full view.

2.2.4 The equipment shall be essentially the standard product of a manufacturer regularly engaged in the production of such equipment and shall be a product of the manufacturer's latest design.

2.2.5 A service organization with personnel and spare parts shall be available within two hours for each type of equipment furnished.

2.2.6 Install in accordance with manufacturer's recommendations. Place in service by a factory trained representative where required.

2.2.7 Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material and type of construction desired. Manufacturer's products shown on the drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's products, or the particular products of named manufacturers, meet the detailed specifications and that size and arrangement of equipment are suitable for installation.

2.2.8 Model Numbers: Catalog numbers and model numbers indicated in the drawings and specifications are used as a guide in the selection of the equipment and are only listed for the contractor's convenience. The contractor shall determine the actual model numbers for ordering materials in accordance with the written description of each item and with the intent of the drawings and specifications.

2.3 Requests for Substitution:

2.3.1 Where a particular system, product or material is specified by name, consider it as standard basis for bidding, and base proposal on the particular system, product or material specified.

2.3.2 Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.

2.3.2.1 Required product cannot be supplied in time for compliance with Contract time requirements.

2.3.2.2 Required product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted or insured, or has other recognized disability as certified by Contractor.

2.3.2.3 Substantial cost advantage is offered Owner after deducting offsetting disadvantages including delays, additional compensation for redesign, investigation, evaluation and other necessary services and similar considerations.

2.3.3 All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate any and all differences or omissions between the product specified as the basis of design and the product proposed for substitution. Differences shall include but shall not be limited to data as follows for both the specified and substituted products:

Principal of operation.
Materials of construction or finishes.
Thickness of gauge of materials.
Weight of item.
Deleted features or items.
Added features or items.
Changes in other work caused by the substitution.
Performance curves.

If the approved substitution contains differences or omissions not specifically called to the attention of the Architect/Engineer, the Owner reserves the right to require equal or similar features to be added to the substituted products (or to have the substituted products replaced) at the Contractor's expense.

3 EXECUTION

3.1 Workmanship: All materials and equipment shall be installed and completed in a first-class workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which do not present an orderly and reasonably neat and/or workmanlike appearance, or do not allow adequate space for maintenance, shall be removed and replaced when so directed by the Architect/Engineer.

3.2 Coordination:

3.2.1 The Contractor shall be responsible for full coordination of the mechanical systems with shop drawings of the building construction so the proper openings and sleeves or supports are provided for piping, ductwork, or other equipment passing through slabs or walls.

3.2.2 Any additional steel supports required for the installation of any mechanical equipment, piping, or ductwork shall be furnished and installed under the section of the specifications requiring the additional supports.

3.2.3 It shall be the Contractor's responsibility to see that all equipment such as valves, dampers, filters and such other apparatus or equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the drawings.

3.2.4 All connections to fixtures and equipment shown on the drawings shall be considered diagrammatic unless otherwise indicated by detail. The actual connections shall be made to fully suit the requirements of each case and adequately provide for expansion and servicing.

3.2.5 The contractor shall protect equipment, material, and fixtures at all times. He shall replace all equipment, material, and fixtures which are damaged as a result of inadequate protection.

3.2.6 Prior to starting and during progress of work, examine work and materials installed by others as they apply to work in this division. Report conditions which will prevent satisfactory installation.

3.2.7 Start of work will be construed as acceptance of suitability of work of others.

3.3 Interruption of Service: Before any equipment is shut down for disconnecting or tie-ins, arrangements shall be made with the Architect/Engineer and this work shall be done at the time best suited to the Owner. This will typically be on weekends and/or holidays and/or after normal working hours. Services shall be restored the same day unless prior arrangements are made. All overtime or premium costs associated with this work shall be included in the base bid.

3.4 Phasing: Provide all required temporary valves, piping, ductwork, equipment and devices as required. Maintain temporary services to areas as required. Remove all temporary material and equipment on completion of work unless Engineer concurs that such material and equipment would be beneficial to the Owner on a permanent basis.

3.5 Cutting and Patching: Notify General Contractor to do all cutting and patching of all holes, chases, sleeves, and other openings required for installation of equipment furnished and installed under this section. Utilize experienced trades for cutting and patching. Obtain permission from Architect/Engineer before cutting any structural items.

3.6 Equipment Setting: Bolt equipment directly to concrete pads or vibration isolators as required, using hot-dipped galvanized anchor bolts, nuts and washers. Level equipment.

3.7 Painting: Touch-up factory finishes on equipment located inside and outside shall be done under Division 15. Obtain matched color coatings from the manufacturer and apply as directed. If corrosion is found during inspection on the surface of any equipment, clean, prime, and paint, as required.

3.8 Clean-up: Thoroughly clean all exposed parts of apparatus and equipment of cement, plaster, and other materials and remove all oil and grease spots. Repaint or touch up as required to look like new. During progress of work, contractor is to carefully clean up and leave premises and all portions of building free from debris and in a clean and safe condition.

3.9 Start-up and Operational Test: Start each item of equipment in strict accordance with the manufacturer's instructions; or where noted under equipment specification, start-up

shall be done by a qualified representative of the manufacturer. Alignment, lubrication, safety, and operating control shall be included in start-up check.

3.10 Climate Control: Operate heating and cooling systems as required after initial startup to maintain temperature and humidity conditions to avoid freeze damage and warping or sagging of ceilings and carpet.

3.11 Record Drawings:

3.11.1 During the progress of the work the Contractor shall record on their field set of drawings the exact location, as installed, of all piping, ductwork, equipment, and other systems which are not installed exactly as shown on the contract drawings.

3.11.2 Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 sections.

3.12 Acceptance:

3.12.1 Punch List: Submit written confirmation that all punch lists have been checked and the required work completed.

3.12.2 Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with project, for one day to instruct permanent operating personnel in operation of equipment and control systems. This is in addition to any specific equipment operation and maintenance training.

3.12.3 Operation and Maintenance Manuals: Furnish four complete manuals bound in ring binders with Table of Contents, organized, and tabbed by specification section. Manuals shall contain:

Detailed operating instructions and instructions for making minor adjustments.
Complete wiring and control diagrams.
Routine maintenance operations.
Manufacturer's catalog data, service instructions, and parts lists for each piece of operating equipment.
Copies of approved submittals.
Copies of all manufacturer's warranties.
Copies of test reports and verification submittals.

3.12.4 Record Drawings: Submit record drawings.

3.12.5 Test and Balance Report: Submit four certified copies. The Report shall be submitted for review prior to the Substantial Completion Inspection unless otherwise required by Division 1.

3.12.6 Acceptance will be made on the basis of tests and inspections of job. A representative of firm that performed test and balance work shall be in attendance to assist. Contractor shall furnish necessary mechanics to operate system, make any necessary adjustments and assist with final inspection.

**This is a sample cover sheet. Use one for each shop drawing.**

PROJECT NAME
PROJECT NUMBER

SAMPLE

ARCHITECT/ENGINEER: Campbell Engineering of North Florida, Inc.

CONTRACTOR: XYZ Construction

SUBCONTRACTOR: ABC Mechanical Contractor

**Use whatever standard headings you want here**

SUPPLIER: Jones Supply Co.

MANUFACTURER: Various

DATE: 2/15/95

SECTION: 15545/Hydronic Specialties

1. Vent valves - Hoffman No. 62

**List each item separately**

2. In-line air separators - Bell & Gossett RL-4

**Typical - list mfr name & model number**

3. Diaphragm type compression tanks - Bell & Gossett B-200

4. Pump suction diffusers - Bell & Gossett ED-3

5. Triple duty valves - Bell & Gossett 3D-4S

**CENF will list all comments on this sheet and will only stamp approvals on this sheet**

6. Shot feeders - J. Woods No. 2

**Leave space after each individual item for CENF comments**

7. Pressure relief valves - Watts No. 6

8. Pressure reducing valves - Bell & Gossett No. 7

**General Contractor's APPROVAL stamp must be on this sheet.**

END OF SECTION

# SECTION 15020/CODES AND STANDARDS

## 1 GENERAL

1.1 The work covered by this division consists of providing all labor, equipment and materials and performing all operations necessary for the installation of the mechanical work as herein called for and shown on the drawings.

1.2 This is a Basic Mechanical Requirements section. Provisions of this section apply to work of all Division 15 sections.

## 2 CODES

2.1 All work under Division 15 shall be constructed in accordance with the codes listed herein. The design has been based on the requirements of these codes; and while it is not the responsibility of the Contractor to verify that all work called for complies with these codes, he shall be responsible for calling to the Architect/Engineer's attention any drawings or specifications that are not in conformance with these or other codes prior to ordering equipment or installing work.

2.2 Comply with regulations and codes of utility suppliers.

2.3 Where no specific method or form of construction is called for in the contract documents, the Contractor shall comply with code requirements when carrying out such work.

2.4 Where code conflict exists, generally the most restrictive requirement applies. Comply with current code edition, unless noted.

2.5 Additional codes or standards applying to a specific part of the work may be included in that section.

2.6 The following codes govern the work:

2.6.1 Florida Building Code, 2004.

2.6.2 National Electric Code (NFPA 70)

2.6.3 Life Safety Code (NFPA 101)

2.6.4 Installation of Air Conditioning and Ventilation Systems (NFPA 90A)

## 3 STANDARDS

All mechanical materials, installation and systems shall meet the requirements of the following standards, including the latest addenda and amendments, to the extent referenced:

3.1 Underwriters' Laboratories (UL)

3.2 American National Standards Institution (ANSI)

3.3 American Society of Testing Materials (ASTM)

3.4 National Fire Protection Association (NFPA)

3.5 National Electrical Manufacturers Association (NEMA)

3.6 Air Conditioning and Refrigeration Institute (ARI)

3.7 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

3.8 American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)

3.9 Air Movement and Control Association (AMCA)

END OF SECTION

SECTION 15030/MECHANICAL RELATED WORK

1 DIVISION 1 - GENERAL REQUIREMENTS

1.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 This is a Basic Mechanical Requirements section. Provisions of this section apply to work of all Division 15 sections.

1.3 Coordinate with the General Contractor for all cutting and patching. Contractors performing Division 15 work shall inform the General Contractor of all cutting and patching required prior to bidding and shall coordinate installation.

2 DIVISION 2 - SITE WORK

2.1 Specific requirements for excavation and backfill for underground piping are contained in Section 15190.

2.2 Refer to Division 2, Sitework for:

2.2.1 All water, sewer, and storm water piping greater than five feet from the building.

2.2.2 All site fire protection piping, except as indicated on the drawings.

2.2.3 Grease trap.

3 DIVISION 3 - CONCRETE

3.1 Refer to Division 3, Concrete for:

3.1.1 Rough grouting in and around mechanical work.

3.1.2 Patching concrete cut to accommodate mechanical work.

3.2 The following is part of Division 15 work, complying with the requirements of Division .3

3.2.1 Curbs, foundations and pads for mechanical equipment.

4 DIVISION 4 - MASONRY

4.1 Refer to Division 4, Masonry for:

4.1.1 Installation of wall louvers.

4.1.2 Installation of access doors in walls.

5 DIVISION 5 - METALS

5.1 Refer to Division 5, Metals for:

5.1.1 Framing openings for mechanical equipment.

5.2 The following is part of Division 15 work.

5.2.1 Supports for mechanical work.

6 DIVISION 6 - WOOD AND PLASTIC

6.1 Refer to Division 6, Wood for:

6.1.1 Framing openings for mechanical equipment

7 DIVISION 7 - THERMAL AND MOISTURE PROTECTION

7.1 Refer to Division 7, Thermal and Moisture Protection for:

7.1.1 Caulking and waterproofing of all wall and roof mounted mechanical work.

7.2 The following is part of Division 15 work, complying with the requirements of Division 7.

7.2.1 Fire barrier penetration seals.

8 DIVISION 8 - DOORS AND WINDOWS

8.1 Refer to Division 8, Doors & Windows for:

8.1.1 Installation of all door grilles.

8.1.2 Providing all undercuts

9 DIVISION 9 - FINISHES

9.1 Refer to Division 9, Finishes for:

9.1.1 Painting exposed ductwork, piping, and equipment.

9.1.2 Painting structural metal and concrete for mechanical work.

9.1.3 Painting door grilles and access panels.

9.1.4 Painting color-coded mechanical work indicated for continuous painting. See color schedule in Division 15 section, "Mechanical Identification".

9.1.5 Installation of access doors in gypsum drywall.

9.2 Colors shall be selected by the Architect for all painting of exposed mechanical work in occupied spaces, unless specified herein. Do not paint insulated or jacketed surfaces.

9.3 Perform the following as part of Division 15 work:

9.3.1 Touch up painting of factory finishes.

9.3.2 Painting of all hangers.

10 DIVISION 10 - SPECIALTIES

10.1 Refer to Division 10 - Specialties for:

10.1.1 Fire extinguishers and fire extinguisher cabinets and accessories.

11 DIVISION 11 - EQUIPMENT

11.1 Refer to Division 11 - Equipment for all food service equipment to be provided. This includes the dishwasher booster heaters, and food preparation/cleanup equipment.

11.2 Provide the following as part of Division-15 work:

11.2.1 All kitchen cooking hoods and ducts, fans, connections, and related devices to make kitchen hoods operational. The cooking hood and fire suppression system shall be provided by the Mechanical Contractor.

11.2.2 All trim including faucets, waste connections, drain traps, vents, valves, piping, flashing, fittings, strainers, and other materials necessary to make equipment operational. Provide rough-in for all equipment. Provide final connections for all equipment.

11.2.3 All fixtures specified in Section 15430.

11.2.4 All automatic gas valves for shutoff of gas to cooking appliances when fire suppression system activates. Coordinate type of valve with fire suppression system supplier.

12 DIVISION 16 - ELECTRICAL

12.1 Mechanical contractor shall coordinate the exact electrical requirements of all mechanical equipment being provided with the electrical contractor. Where approval submittals are required, this coordination shall be accomplished prior to making the submittals. The electrical design shown on the drawings supports the mechanical equipment basis of design. If mechanical equipment is submitted with different electrical requirements, it is the responsibility of the mechanical contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the mechanical submittal with a written statement that this design will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

12.2 Mechanical contractor shall provide all HVAC control wiring including sensors, alarms,

and input/output signals and all relays, interlocks, warning lights, and control devices, complying with the requirements of Division 16. The intent is for the mechanical contractor to be responsible for the entire HVAC control system, including point-to-point wiring.

12.3 Electrical contractor shall provide disconnect switches, starters, and contactors for mechanical equipment unless specifically noted as being furnished as part of mechanical equipment.

12.4 Electrical contractor shall provide all power wiring, raceway and devices, and make final electrical connections to all mechanical equipment, switches, starters, contactors, controllers, and similar equipment.

12.5 All duct-mounted smoke detectors shall be furnished and wired by the electrical contractor and installed by the mechanical contractor.

END OF SECTION

# SECTION 15105/PIPES AND PIPE FITTINGS

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to pipes and pipe fittings specified herein.

1.3 Extent of pipes and pipe fittings required by this section is indicated on drawings and/or specified in other Division-15 sections.

1.4 Codes and Standards:

1.4.1 NSF Labels: Where plastic piping is indicated to transport potable water, provide pipes and pipe fittings bearing approval label by National Sanitation Foundations (NSF).

## 2 PRODUCTS

2.1 Piping Materials: Provide pipe and tube 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.

2.2 Pipe/Tube Fittings: Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve or equipment connection in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.

2.3 Piping Materials/Products:

2.3.1 Soldering Materials: Solders for domestic water service shall be NSF approved or tested to contain no impurities of lead.

2.3.1.1 Solder joints will be provided with a lead free filler material approved by NSF (National Sanitation Foundation) and in compliance with ANSI 61 suitable for domestic water systems. Selection of solder may be made from the following list.

J.W. Harris Company, Inc.
Phone: 513-754-6142
Stay Brite, Stay Brite 8, Bridgit, NICK, and with limited use per manufacturers directions Stay-Silv 6HP.

Taracorp, Inc.
Phone 770-955-1445
Taramet Sterling, Tarasil 964, Tarasil 946, Soldersafe, Soldersafe with silver, or Dutchboy.

2.3.1 Construction: Construct valves of castings free of any impregnating materials. Construct valves with a bronze regrinding disc with a seating angle of 40º to 45º, unless a composition disc is specified. Provide stop plug as renewable stop for disc hanger, unless otherwise specified. Disc and hanger shall be separate parts with disc free to rotate. Support hanger pins on both ends by removable side plugs.

2.3.2 Comply with the following standards:

Cast Iron Valves: MSS SP-71. Cast Iron Swing Check Valves, Flanged and Threaded Ends.
Bronze Valves: MSS SP-80. Bronze Gate, Globe, Angle and Check Valves.
Steel Valves: ANSI B16.34. Steel Standard Class Valve Ratings.

2.3.3 Types of check (CK) valves:

1 Threaded Ends 2" and Smaller (CK1): Class 125, bronze body, screwed cap, horizontal swing, bronze disc. Stockham B-319. Nibco T-413-BY. Crane 1707. Milwaukee 509.

2 Soldered Ends 2" and Smaller (CK2): Class 125, bronze body, screwed cap, horizontal swing, bronze disc. Stockham B-309. Nibco S-413-B. Crane 1707S. Milwaukee 1509.

3 Flanged Ends 2½" and Larger (CK3): Class 125, iron body, bronze-mounted, bolted cap, horizontal swing, cast-iron or composition disc. Stockham G-931 or G-932 as applicable. Nibco F918-B. Crane 373. Milwaukee F2974 as applicable.

4 Threaded Ends 2" and Smaller (CK4): 200 WWP, bronze body, screwed cap, horizontal swing, regrinding type bronze disc, for fire sprinkler use. Nibco KT-403-W.

5 Flanged Ends 2½" and Larger (CK5): 175 WWP, iron body, bolted cap, bronze mounted, composition disc, UL listed, with ball drip if required. Stockham G-940. Nibco F-908-W.

6 Threaded Ends 2" and Smaller (CK6): Class 200, bronze body, screwed cap, Y-pattern swing, regrinding bronze disc. Stockham B-345. Nibco T-453-B. Crane 36. Milwaukee 518/508.

7 Flanged Ends 2½" and Larger (CK7): Class 250, iron body, bronze mounted, bolted cap, cast-iron disc. Stockham F-947. Nibco F-968-B. Crane 39E. Milwaukee F2970.

8 Threaded Ends 2" and Smaller (CK8): Class 300, bronze body, screwed cap, Y-pattern swing, regrinding bronze disc. Stockham B-375. Nibco T-473-B. Crane 76E. Milwaukee 517/507.

9 Flanged Ends 2½" and Larger (CK9): Class 300, cast steel body, bolted cap, horizontal swing, seal welded seat rings, chromium stainless disc. Stockham 30-

SF. Crane 159.

2.6 Ball Valves:

2.6.1 General: Select with port area equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.

2.6.2 Construction: Ball valves shall be rated for 150 psi saturated steam and 600 psi non-shock cold water. Pressure containing parts shall be constructed of ASTM B-584 alloy 844, or ASTM B-124 alloy 377. Valves shall be furnished with blow-out proof bottom loaded stem constructed of ASTM B-371 alloy 694 or other approved low zinc material. Provide TFE packing, TFE thrust washer, chrome-plated ball and reinforced teflon seats. Valves 1" and smaller shall be full port design. Valves 1¼" and larger shall be conventional port design. Stem extensions shall be furnished for use in insulated piping where insulation exceeds ½" thickness.

2.6.3 Comply with the following standards:

MSS SP-72. Ball Valves with Flanged or Butt Welding Ends for General Service.
MSS SP-110. Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

2.6.4 Types of ball (BA) valves:

1 Threaded Ends 2" and Smaller (BA1): Bronze two-piece full port body with adjustable stem packing. Nibco T-585-70. Stockham S216-BR-R-T. Milwaukee BA125. Apollo 77-100.

2 Soldered Ends 2" and Smaller (BA2): Bronze three-piece full port body with adjustable stem packing. Nibco S-595-Y-66. Milwaukee BA350. Apollo 82-200.

3 Threaded Ends 1" and Smaller (BA3): Bronze two-piece full port body, UL listed (UL 842) for use with flammable liquids and LP gas. Nibco T-585-70-UL.

4 Threaded Ends 2" and Smaller (BA4): 175 WWP, bronze two-piece body, UL listed for fire protection service. Nibco KT-585-70-UL and KT-580-70-UL.

5 Threaded Ends 2" and Smaller (BA5): 400 WWP, bronze two-piece body, for fire protection service. Nibco KT-580.

6 Threaded Ends 2½" and Smaller (BA6): 300 WWP, bronze three-piece body, gear operator with handwheel, indicator flag, accepts tamper switch, for fire protection, UL listed. Nibco T-505-4 and G-505-4.

7 Flanged Ends 2½" and Larger (BA7): Class 150, carbon steel full bore two-piece body with adjustable stem packing. Nibco F515-CS series. Apollo 88-240.

2.7 Valve Features:

2.7.1 General: 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

2.7.2 Valve features specified or required shall comply with the following:

1 Drain: Comply with MSS SP-45, and provide threaded pipe plugs complying with applicable Division-15 pipe or tube section. Provide for gate valves 8" and larger.

2 Solder-Joint: Provide valve ends complying with ANSI B16.18.

3 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 unless otherwise specified.

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

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

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

3 EXECUTION

3.1 Installation:

3.1.1 General: Install valves where required for proper operation of piping and equipment, including valves in branch lines to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward below horizontal plane.

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

3.1.3 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.

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

3.2.1 Tube Size 2" and Smaller: Threaded valves. Soldered-joint valves may also be used.

3.3 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.

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

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

END OF SECTION

SECTION 15120/PIPING SPECIALTIES

1 GENERAL

1.1 Drawings and general provisions of contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to or requiring piping specialties specified herein.

1.3 Approval Submittals:

1.3.1 Product Data: Submit product data with installation instructions and UL listing for:

1.3.1.1 Fire barrier sealants.

2 PRODUCTS

2.1 General: 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.

2.2 Escutcheons:

2.2.1 General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.

2.2.2 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.

2.2.3 Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.

2.3 Dielectric Unions: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action and stop corrosion.

2.4 Fire Barrier Penetration Seals:

2.4.1 Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for mechanical components such as piping or ductwork in accordance with the requirements of Division 7.

2.4.2 Cracks, Voids, or Holes Up to 4" Diameter: Use putty or calking, 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.

2.4.3 Openings 4" or Greater: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E-814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350°F, UL-listed.

2.5 Fabricated Piping Specialties:

2.5.1 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 ¼" steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.

2.5.2 Pipe Sleeves: Provide pipe sleeves of one of the following:

2.5.2.1 Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gages: 3" and smaller, 20 gage; 4" to 6" 16 gage; over 6", 14 gage.

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

2.5.2.3 Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.

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

2.5.3.1 Caulking and Sealant: Provide foam or caulking and sealant compatible with piping materials used.

3 EXECUTION

3.1 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 is flush with adjoining surface.

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

3.3 Fire Barrier Penetration Seals: Provide pipe sleeve as required. Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions. Refer to Division 7.

3.4 Drip Pans: Locate drip pans under piping passing over or within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang from 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.

3.5 Pipe 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 ¼" above level floor finish, and ¾" above floor finish sloped to drain. 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.

3.5.1 Install sleeves in fire-rated assemblies in accordance with the listing of the assembly and the fire barrier sealant.

3.5.2 Install sheet-metal sleeves at interior partitions and ceilings other than suspended ceilings. Fill annular space with caulking or fire barrier sealant as required.

3.5.3 Install steel-pipe sleeves at floor penetrations. Fill annular space with caulking or fire barrier sealant as required.

3.5.4 Install iron-pipe sleeves at all foundation wall penetrations and at exterior penetrations; both above and below grade. Fill annular space with caulking or mechanical sleeve seals.

END OF SECTION

SECTION 15140/METERS AND GAUGES

1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to or requiring meters and gauges specified herein.

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

1.4 UL Compliance: Comply with applicable UL standards pertaining to meters and gauges.

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

1.6 Approval Submittals:

1.6.1 Product Data: When required by other Division-15 sections, submit manufacturer's technical product data for each type of meter and gauge. Submit with Division-15 section using meters and gauges, not as a separate submittal. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit for:

1.6.1.1 Thermometers

1.6.1.2 Pressure gauges

1.7 O&M Data Submittals: Submit a copy of approval submittals. Submit calibration curves and operating instructions for each type of meter or gauge. Include this data in O&M Manual.

2 PRODUCTS

2.1 Acceptable Manufacturers (Thermometers and Pressure Gauges): Subject to compliance with requirements, Ashcroft, Ernst Gauge Company, Weksler, Marshalltown Instruments, Trerice, Weiss Instruments, Wheatley, Fluidyne or approved equal.

2.2 Glass Thermometers:

2.2.1 General: Provide glass thermometers of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.

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

2.2.3 Adjustable Joint: Die cast aluminum, finished to match case, 180° adjustment in vertical plane, 360° adjustment in horizontal plane, with locking device.

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

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

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

2.2.7 Range: Conform to the following:

2.2.7.1 Hot Water: 30° - 240°F with 2°F scale divisions.

2.3 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. Same manufacturer as thermometers.

2.4 Pressure Gauges:

2.4.1 General: Provide pressure gauges of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.

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

2.4.3 Case: Drawn steel or brass, glass lens, 4-½" diameter.

2.4.4 Connector: Brass with ¼" male NPT. service.

2.4.5 Scale: White coated aluminum with black scale.

2.4.6 Range: Select so that highest possible pressure does not exceed 75% of full scale.

2.5 Pressure Gauge Cocks:

2.5.1 General: Provide ¼" ball valves for use as pressure gauge cocks.

2.5.2 Snubber: ¼" brass bushing with corrosion resistance porous metal disc, through which pressure fluid is filtered. Select disc material for fluid served and pressure rating.

3 EXECUTION

3.1 Installation Of Temperature Gauges:

3.1.1 General: Install temperature gauges in vertical upright position, and tilt so as to be easily read by observer standing on floor.

3.1.2 Locations: Install in the following locations, and elsewhere as indicated:

3.1.2.1 At inlet and outlet of each thermal storage tank.

3.1.3 Thermometer Wells: Install in piping tee where indicated, in vertical upright position. Thermometers shall have at least 75% of stem in moving fluid.

3.2 Installation of Pressure Gauges:

3.2.1 General: Install pressure gauges in piping tee with pressure gauge cock, located on pipe at most readable position.

3.2.2 Locations: Install in the following locations, and elsewhere as indicated:

3.2.2.1 At discharge of each water pressure reducing valve.

3.2.2.2 At water service outlet.

3.2.3 Pressure Gauge Cocks: Install in piping tee with snubber.

3.2.4 Pressure Gauge Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

3.3 Adjusting And Cleaning:

3.3.1 Adjusting: Adjust faces of meters and gauges to proper angle for best visibility.

3.3.2 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

# SECTION 15150/SUPPORTS, ANCHORS, AND SEALS

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-15 Basic Materials and Methods section, and is a part of each Division-15 section making reference to or requiring supports, anchors, and seals specified herein.

1.3 Extent of supports, anchors, and seals required by this section is indicated on drawings and/or specified in other Division-15 sections.

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

1.5 MSS Standard Compliance:

1.5.1 Provide pipe hangers and supports of which materials, design, and manufacture comply with ANSI/MSS SP-58.

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

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

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

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

## 2 PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide supports and hangers by Grinnel, Michigan Hanger Company, B-Line Systems, or approved equal.

2.2 Horizontal-Piping Hangers and Supports: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with ANSI/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.

2.2.1 Adjustable Steel Clevises: MSS Type 1.

2.2.2 Steel Double Bolt Pipe Clamps: MSS Type 3.

2.2.3 Adjustable Steel Band Hangers: MSS Type 7.

2.2.4 Steel Pipe Clamps: MSS Type 4.

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

2.2.6 Single Pipe Rolls: MSS Type 41.

2.2.7 Adjustable Roller Hanger: MSS Type 43.

2.2.8 Pipe Roll Stands: MSS Type 44 or Type 47.

2.3 Vertical-Piping Clamps: Except as otherwise indicated, provide factory-fabricated vertical-piping clamps complying with ANSI/MSS SP-58, of one of the following MSS 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.

2.3.1 Two-Bolt Riser Clamps: MSS Type 8.

2.3.2 Four-Bolt Riser Clamps: MSS Type 42.

2.4 Hanger-Rod Attachments: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with ANSI/MSS SP-58, 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 one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

2.4.1 Steel Turnbuckles: MSS Type 13.

2.4.2 Malleable Iron Sockets: MSS Type 16.

2.5 Building Attachments: Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.

2.5.1 Center Beam Clamps: MSS Type 21.

2.5.2 C-Clamps: MSS Type 23.

2.5.3 Malleable Beam Clamps: MSS Type 30.

2.5.4 Side Beam Brackets: MSS Type 34.

2.5.5 Concrete Inserts: MSS Type 18.

2.6 Saddles and Shields: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

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

2.6.2 Protection Saddles: MSS Type 39; use with rollers, fill interior voids with segments of insulation matching adjoining insulation.

2.7 Miscellaneous Materials:

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

2.7.2 Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A 36.

2.7.3 Cement Grout: Portland cement (ANSI/ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/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.

2.7.4 Heavy-Duty Steel Trapezes: Fabricate from steel shapes or continuous channel struts selected for loads required; weld steel in accordance with AWS standards.

3 EXECUTION

3.1 Preparation

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

3.1.2 Prior to installation of hangers, supports, anchors and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, and installers of other work requiring coordination with work of this section for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.2 Installation of Building Attachments:

3.2.1 Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than

2500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.2.2 In areas of work requiring attachments to existing concrete, use self drilling rod inserts, Phillips Drill Co., "Red-Head" or equal.

3.3 Installation of Hangers and Supports:

3.3.1 General: 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-69 or as listed herein, whichever is most limiting. 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.

3.3.1.1 Horizontal copper tube 1 ½" diameter and smaller: support on 6 foot centers.

3.3.1.2 Horizontal copper tube over 1 ½" diameter: support on 10 foot centers.

3.3.1.3 Vertical copper tube: support at each floor.

3.3.1.4 Plastic pipe: support in accordance with manufacturer's recommendations.

3.3.1.5 Horizontal cast iron pipe inside building: support each length of pipe (at the joint).

3.3.1.6 Vertical cast iron pipe: support at each floor and at the base.

3.3.2 Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.

3.3.3 Paint all black steel hangers with black enamel. Galvanized steel and copper clad hangers do not require paint.

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

3.3.5 Provision for Movement:

3.3.5.1 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 joints, expansion loops, expansion bends and similar units.

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

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

3.3.6 Insulated Piping: Comply with the following installation requirements.

3.3.6.1 Shields: Where low-compressive-strength insulation or vapor barriers are indicated, install coated protective shields.

3.3.6.2 Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.

3.4 Installation of Anchors:

3.4.1 Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.

3.4.2 Fabricate and install anchors by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.

3.4.3 Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and elbows. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.4.4 Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

3.5 Equipment Bases:

3.5.1 Provide concrete housekeeping bases 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. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.

3.5.2 Provide structural steel stands to support equipment requiring bottom return air intakes or 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. Prime and paint with black enamel.

END OF SECTION

# SECTION 15160/MECHANICAL IDENTIFICATION

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to or requiring identification devices specified herein.

1.3 Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division-15 sections.

1.4 Refer to Division-16 sections for identification requirements of electrical work; not work of this section. Refer to other Division-15 sections for identification requirements for controls; not work of this section.

1.5 Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

## 2 PRODUCTS

2.1 General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division-15 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.

2.2 Painted Identification Materials

2.2.1 Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendations of ANSI A13.1 for piping and similar applications, but not less than 1-¼" high letters for ductwork and not less than ¾" high letters for access door signs and similar operational instructions.

2.2.2 Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.

2.2.3 Identification Paint: Standard identification enamel.

2.3 Plastic Pipe Markers

2.3.1 Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers.

2.3.1.1 Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with name as shown or specified.

2.3.1.2 Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

2.4 Valve Tags:

2.4.1 Brass Valve Tags: Provide 19-gage polished brass valve tags with stamp-engraved piping system abbreviation in ¼" high letters and sequenced valve numbers ½" high, and with 5/32" hole for fastener. Provide 1-½" diameter tags, except as otherwise indicated.

2.4.2 Plastic Laminate Valve Tags: Provide manufacturer's standard 3/32" thick engraved plastic laminate valve tags, with piping system abbreviation in ¼" high letters and sequenced valve numbers ½" high, and with 5/32" hole for fastener. Provide 1-½" square black tags with white lettering, except as otherwise indicated.

2.5 Engraved Plastic-Laminate Signs:

2.5.1 General: Provide engraving stock melamine plastic laminate, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

2.5.2 Thickness: 1/16" for units up to 20 sq. in. or 8" length; ⅛" for larger units.

2.5.3 Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.6 Stamped Nameplates: Provide equipment manufacturer's standard stamped nameplates for motors, AHUs, pumps, etc.

3 EXECUTION

3.1 Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.2 Ductwork Identification:

3.2.1 General: Identify air supply, return, exhaust, intake and relief ductwork with stenciled signs and arrows, showing ductwork service and direction of flow, in black or white.

3.2.2 Location: In each space where ductwork is exposed, or concealed only by removable ceiling system, locate signs near points where ductwork originates or continues into concealed enclosures, and at 50' spacings along exposed runs.

3.2.3 Access Doors: Provide stenciled signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate and procedural information.

3.3 Piping System Identification:

3.3.1 General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:

3.3.1.1 Plastic pipe markers.

3.3.1.2 Stenciled markers, black or white for best contrast.

3.3.2 Locate pipe markers as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces and exterior non-concealed locations.

3.3.2.1 Near each valve and control device.

3.3.2.2 Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.

3.3.2.3 Near locations where pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.

3.3.2.4 At access doors, manholes and similar access points which permit view of concealed piping.

3.3.2.5 Near major equipment items and other points of origination and termination.

3.3.2.6 Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.

3.3.2.7 On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.3.3 The following piping shall be color-coded where exposed in mechanical and electrical rooms by completely painting the piping with the indicated color. Use standard colors where exposed in finished spaces. Use standard identification methods in concealed areas.

3.4 Mechanical Equipment Identification: Install engraved plastic laminate sign on or near each major item of mechanical equipment and each operational device. Label shall indicate type of system and area served. Provide signs for the following general categories of equipment and operational devices:

3.4.1 Main control and operating valves, including safety devices.

3.4.2 Meters, gauges, thermometers and similar units.

3.4.3 Condensers, and similar equipment.

3.4.4 Fans, primary balancing dampers.

3.4.5 Tanks and pressure vessels.

3.4.6 Air conditioning indoor and outdoor units.

3.5 Stamped Nameplates: Equipment manufacturers to provide standard stamped nameplates on all major equipment items such as motors, pumps, AHUs, etc. Where motors are hidden from view (within equipment casing, or otherwise not easily accessible, etc.), the equipment supplier shall furnish a duplicate motor data nameplate to be affixed to the equipment casing in an easily visible location, unless data is already included on the equipment nameplate.

3.6 Adjusting and Cleaning:

3.6.1 Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.

END OF SECTION

SECTION 15170/ACCESS DOORS

1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to or requiring access panels specified herein.

1.3 Approval Submittals:

1.3.1 Product Data: When required by other Division-15 sections, submit product data for access doors. Submit with Division-15 section usiung access doors, not as a separate submittal. Include rating data.

1.4 O&M Data Submittals: Submit a copy of approval submittal. Include this data in O&M Manuals.

2 PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide access doors by Milcor, Jay R. Smith, Zurn, BOICO, Elmdor, or approved equal.

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

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

2.4 Locks: Where indicated, provide flat pass key type, individually keyed unless otherwise indicated, 2 keys.

2.5 Locks: Provide Folger Adams or approved equal Model 415-6 high security deadlock six lever Number 12. All access doors shall be keyed the same throughout. Coordinate with the General Contractor.

2.6 Fire Rated Access Doors: Where required furnish with 20-gauge insulated sandwich panel, automatic closing mechanism, cylinder type lock (self-latching with inside release mechanism), and continuous concealed steel hinge pin. Access doors shall carry the UL 1-½ hour "B" label.

3 EXECUTION

3.1 Access doors shall be installed to operate and service all mechanical equipment including valves, dampers, duct access panels, and other items requiring maintenance

that are concealed above or behind finished construction. Access doors shall be installed in walls, chase and floors as necessary, but are not required in accessible suspended ceiling systems. Access doors shall have factory applied protective phosphate coating and baked enamel primer suitable for field painting.

3.2 Access doors shall be installed by the Division installing the substrate construction. However, responsibility for furnishing and determining location of access doors is part of this Division's work. The style of access door shall be suitable for construction into which installed.

3.3 Access doors shall be sized and located as required to provide proper maintenance and service access in accordance with the manufacturer's recommendations and code authority requirements for all devices and equipment.

END OF SECTION

# SECTION 15180/TESTING, CLEANING, AND STERILIZATION OF PIPING SYSTEMS

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to or requiring the testing and other procedures specified herein.

1.3 Notify the Architect/Engineer when system tests are ready to be witnessed at least 24 hours prior to the test.

1.4 All materials, test equipment, and devices required for cleaning, testing, sterilizing or purging shall be provided by the Contractor.

## 2 PRESSURE TESTS

2.1 General: Provide temporary equipment for testing, including pump and gauges. Test piping systems 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 indicated medium and pressurize for indicated pressure and time.

2.2 Required test period is four hours.

2.3 No piping, fixtures, or equipment shall be concealed or covered until they have been tested. The contractor shall apply each test and ensure that it is satisfactory for the period specified before calling the Architect/Engineer to observe the test. Test shall be repeated upon request to the satisfaction of those making the inspection.

2.4 Observe each test section for leakage at the end of the test period. Test fails if leakage is observed or if pressure drop exceeds 5% of the test pressure.

2.5 Check of systems during application of test pressures should include visual check for water leakage and soap bubble or similar check for air and nitrogen leakage.

2.6 During heating and cooling cycles, linear expansion shall be checked at all elbows and expansion joints for proper clearance.

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

2.8 Pressure Test Requirements:

a 6" minimum layer of gravel will be required before sand bedding begins. Submit cost proposal if the earth conditions require subcut in excess of 12" or if gravel is required to achieve proper bedding.

3.3 Placing: Pipe shall be carefully handled into place. Avoid knocking loose soil from the banks of the trench into the pipe bed. Rig heavier sections with nylon slings in lieu of wire rope to avoid crushing or chipping. Pipe which is handled with insulation in place, coated pipe, and jacketed pipe shall have special handling slings as required to prevent damage to the material.

3.4 Backfilling: Deposit clean new sand (as described in paragraph 2.1) to 6" above the pipe and tamp. Then deposit sand or earth carefully in 6" layers, maintaining adequate side support, especially on nonferrous piping materials. Compact fill in 6" layers, using mechanical means, up to the top elevation of the pipe, and in 12" layers to rough or finish grade as required. Fine grade and restore surface to original condition.

3.5 Special: Excavations shall be installed and maintained in satisfactory condition during the progress of the work. Subsurface structures are to be constructed in adequately sized excavations. De-watering equipment shall be installed and properly maintained where required. Shoring shall be employed in the event of unstable soil condition, and in all cases where required by OSHA regulations and necessary to protect materials and personnel from injury.

3.6 Identification: Install identification tape directly above all underground piping, one tape for each pipe where multiple pipes are installed. Depth of tape shall be at least 6 inches below finished grade and 24" above buried pipe. Install copper wire above non-metallic pipes.

3.7 Depth of Cover: Minimum cover for underground piping is four feet unless indicated otherwise.

END OF SECTION

# SECTION 15205/INSULATION FOR PLUMBING EQUIPMENT AND PIPING

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods Sections apply to work of this section.

1.3 Approval Submittals:

1.3.1 Product Data: Submit a producer's data sheets and installation instructions on each insulation system including insulation, coverings, adhesives, sealers, protective finishes, and other material recommended by the manufacturer for applications indicated. Submit for:

1.3.1.1 Fiberglass pipe insulation

1.3.1.2 Flexible unicellular piping insulation

1.4 O&M Data Submittals: Submit a copy of all approval submittals. Include in O&M Manual.

## 2 PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide insulation products by Armstrong, Schuller, Knauf, Owens Corning, Pittsburgh Corning, U.S. Rubber, or approved equal. All products shall be asbestos-free.

2.2 Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesive) with a flame-spread rating of 25 or less, and a smoke-developed rating of 50 or less, as tested by ANSI/ASTM E84.

2.3 Pipe Insulation Materials:

2.3.1 Fiberglass Pipe Insulation: ASTM C547, Class 1 unless otherwise indicated. (Preformed sleeving with white all-service jacket, suitable for temperatures up to 450˚F)

2.3.2 Flexible Unicellular Pipe Insulation: ASTM C534, Type I. (Tubular, suitable for use to 200°F.)

2.3.3 Staples, Bands, Wires, and Cement: As recommended by the insulation manufacturer for applications indicated.

2.3.4 Adhesives, Sealers, Protective Finishes: Products recommended by the insulation manufacturer for the application indicated.

2.3.5 Jackets: ASTM C921, Type I (vapor barrier) for piping below ambient temperature, Type

II (vapor permeable) for piping above ambient temperature. Type I may be used for all piping at Installer's option.

3 EXECUTION

3.1 General:

3.1.1 Install thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.

3.1.2 Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.

3.1.3 Maintain integrity of vapor-barrier on insulation and protect it to prevent puncture and other damage. Label all insulation "ASBESTOS FREE".

3.1.4 Do not apply insulation to surfaces while they are hot or wet.

3.1.5 Do not install insulation until systems have been checked and found free of leaks. Surfaces shall be clean and dry before attempting to apply insulation. A professional insulator with adequate experience and ability shall install insulation.

3.1.6 Do not install insulation on pipe systems until acceptance tests have been completed except for flexible unicellular insulation. Do not install insulation until the building is "dried-in".

3.2 Fiberglass Pipe Insulation:

3.2.1 Insulate the following piping systems (indoor locations):

3.2.1.1 Domestic hot water, 140° F: up to 3" pipe - 1½" thick, over 3" pipe - 2" thick.

3.2.1.2 Storm water piping above ceilings including roof drain body - ½" thick.

3.2.1.3 Cold water pipe: ½" thick outside insulated envelope of the building.

3.2.2 Apply insulation to pipe with all side and end joints butted tightly. Seal longitudinal lap by pressurizing with plastic sealing tool. Apply 3 inch wide self sealing butt strips to joints between insulation sections. Insulate all fittings, flanges, valves and strainers with premolded insulation. Apply coat of insulating cement to fittings and wrap with glass cloth overlapping each wrap 1" and adjacent pipe 2". Finish with heavy coat of general purpose mastic. Premolded PVC covers may also be used, but no flexible inserts are allowed.

3.2.3 Provide hanger or pipe support shields of 16 gauge (minimum) galvanized steel over the insulation which extends halfway up the pipe insulation cover and at least 6" on each side of the hanger.

3.2.4 Omit insulation on exposed plumbing fixture runouts from faces of wall or floor to fixture; on unions, flanges, strainer blowoffs, flexible connections and expansion joints.

3.3 Flexible Unicellular Pipe Insulation:

3.3.1 Insulate the following piping systems:

3.3.1.1 Horizontal above-grade waste piping receiving condensate from air conditioning units to points of connection receiving waste from 4 or more fixtures - ½" thick.

3.3.1.2 Horizontal above grade waste piping receiving discharge from ice machines, coolers, freezers or similar units to points of connection receiving waste form 4 or more fixtures - ½" thick.

3.3.2 Apply insulation in accordance with the manufacturer's recommendations and instructions. Mitre cut insulation to fit pipe fittings. Use approved cement to seal all joints and ends in the insulation.

END OF SECTION

# SECTION 15210/INSULATION FOR HVAC EQUIPMENT AND PIPING

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods Sections apply to work of this section.

1.3 Approval Submittals:

1.3.1 Product Data: Submit producer's data sheets and installation instructions on each insulation system including insulation, coverings, adhesives, sealers, protective finishes, and other material recommended by the manufacturer for applications indicated. Submit for:

1.3.1.1 Flexible unicellular piping insulation

1.4 O&M Data Submittals: Submit a copy of all approval submittals. Include in O&M Manual.

## 2 PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide insulation products by Armstrong, Schuller, Knauf, Owens Corning, Pittsburgh Corning, U.S. Rubber, or approved equal. All products shall be asbestos-free.

2.2 Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesive) with a flame-spread rating of 25 or less, and a smoke-developed rating of 50 or less, as tested by ANSI/ASTM E84.

2.3 Pipe Insulation Materials:

2.3.1 Flexible Unicellular Pipe Insulation: ASTM C534, Type I. (Tubular, suitable for use to 200°F.)

2.3.2 Staples, Bands, Wires, and Cement: As recommended by the insulation manufacturer for applications indicated.

2.3.3 Adhesives, Sealers, Protective Finishes: Products recommended by the insulation manufacturer for the application indicated.

2.3.4 Jackets: ASTM C921, Type I (vapor barrier) for piping below ambient temperature, Type II (vapor permeable) for piping above ambient temperature. Type I may be used for all piping at Installer's option.

## 3 EXECUTION

3.1 General:

3.1.1 Install thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.

3.1.2 Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.

3.1.3 Maintain integrity of vapor-barrier on insulation and protect it to prevent puncture and other damage. Label all insulation "ASBESTOS FREE".

3.1.4 Do not apply insulation to surfaces while they are hot or wet.

3.1.5 Do not install insulation until systems have been checked and found free of leaks. Surfaces shall be clean and dry before attempting to apply insulation. A professional insulator with adequate experience and ability shall install insulation.

3.1.6 Do not install insulation on pipe systems until acceptance tests have been completed except for flexible unicellular insulation. Do not install insulation until the building is "dried-in".

3.2 Flexible Unicellular Pipe Insulation:

3.2.1 Insulate the following piping systems:

3.2.1.1 Condensate drains from air conditioning units - ½" thick.

3.2.1.2 Refrigerant piping - ¾" thick.

3.2.2 Apply insulation in accordance with the manufacturer's recommendations and instructions. Mitre cut insulation to fit pipe fittings. Use approved cement to seal all joints and ends in the insulation.

3.2.3 Insulation outside the building shall be protected by a 0.016" thickness aluminum jacket with aluminum bands on 12" centers.

END OF SECTION

# SECTION 15230/EXTERIOR INSULATION FOR DUCTWORK

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Approval Submittals:

1.3.1 Product Data: Submit producer's data sheets and installation instructions on each insulation system including insulation, coverings, adhesives, sealers, protective finishes, and other material recommended by the manufacturer for applications indicated. Submit for:

1.3.1.1 Rigid duct insulation

1.3.1.2 Flexible duct insulation

1.4 O&M Data Submittals: Submit a copy of all approval submittals. Include in O&M Manual.

## 2 PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide insulation products by Knauf, Owens-Corning, Schuller, Certainteed.

2.2 Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, coverings, sealers, mastic, and adhesive) with a flame spread rating of 25 or less, and a smoke-developed rating of 50 or less as tested by ANSI/ASTM 84.

2.3 Flexible Fiberglass Insulation: ASTM C553, Type I, Class B-3 (temperature less than 350°F). Duct wrap shall be 1 pcf density R-6 with UL rated aluminum foil vapor barrier (FSK).

2.4 General Purpose Mastic: Benjamin Foster 35-00 Series, Insulcoustic VIAC Mastic, Childers CP-10, or approved equal. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.

2.5 Vapor Barrier Sealant: Benjamin Foster 30-35, Insulcoustic IC-501, 3M EC-1378, Childers CP-30, or approved equal. Provide "Low Odor" type. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.

2.6 Adhesive: Benjamin Foster 85-20, Insulcoustic IC-205, 3M EC-35, Childers CP-82, Childers CP-89, or approved equal. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.

2.7 Fiber-Glas Mesh: 10x10 Mesh. Foster Mastafab or equal.

3 EXECUTION

3.1 Insulate all supply, return and outdoor air ductwork, and the backs of all ceiling supply outlets with 2" thick fiberglass blanket insulation with vapor barrier.

3.2 Installation of Flexible Insulation:

3.2.1 Insulate round elbows and fittings with wrap such that thickness is equal to adjoining duct covering. Clean and dry ductwork prior to insulating.

3.2.2 Adhere insulation to duct with 50 percent coverage using approved insulation adhesive applied in 6-inch wide swaths with 6-inch spaces between swaths. Additionally secure insulation with perforated pins and Tuff-Bond or by self-sticking pins with a 3/8" self-tapping screw. Space on 12-inch centers and 3 inches from all edges. Ducts up through 24" wide only require one row of pins. Ducts over 24" wide shall have pins spaced as described herein.

3.2.3 Lap all joints 2 inches and seal joints with 4-inch wide strips of open mesh glass fabric embedded in two coats of general purpose mastic.

3.2.4 Seal all punctures and breaks in aluminum vapor barrier with open mesh glass fabric and vapor barrier sealant.

END OF SECTION

SECTION 15340/BUILDING SPRINKLER AND STANDPIPE SYSTEM- DESIGN BY CONTRACTOR

1 GENERAL

1.1 Drawings and General provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Requirements and Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Provide for the design and installation of a wet pipe sprinkler system and/or a drypipe system in the attic and all underground piping out to and including the post indicator valve and backflow preventer. The Contractor is the Engineer-of-Record. (NOTE: Construction is wood framing.) Office building is separated from Care Center and will not require sprinklers.

1.4 Codes and Standards:

1.4.1 NFPA Compliance: Install fire protection systems in accordance with NFPA 13 "Standard for the Installation of Sprinkler Systems".

1.4.2 UL Compliance: Provide fire protection products in accordance with UL standards; provide UL label on each product.

1.4.3 Fire Department/Marshal Compliance: Install fire protection systems in accordance with local regulations of fire department or fire marshal.

1.4.4 Screw Thread Connections: Comply with local Fire Department/Fire Marshal regulations for sizes, threading and arrangement of connections for fire department equipment to sprinkler systems.

1.5 Test Reports and Verification Submittals:

1.5.1 Certificate: Submit certificates of Aboveground and Underground Installation upon completion of fire protection piping work which indicates that work has been tested in accordance with NFPA 13 and that system is operational, complete, and has no defects.

1.5.2 Tag: Submit a copy of the sprinkler system tag. The installing fire sprinkler contractor shall be licensed in accordance with State Fire Marshal (SFM) Rule 4A-46. At the conclusion of the project and prior to the final inspection by the SFM the Contractor shall tag the fire sprinkler system in accordance with 4A-46.041.

1.6 O&M Data Submittals:

1.6.1 Record Drawings: At project closeout, submit record drawings of installed fire protection piping and products.

1.6.2 Maintenance Data: Submit a copy of all approval submittals. Submit maintenance data and parts lists for basic valves, special valves.

1.6.3 NFPA 25: Provide a copy of NFPA 25 in each O&M Manual.

2 PRODUCTS

2.1 General: Provide materials and factory-fabricated products of sizes, types, pressure ratings, temperature ratings, and capacities as required. Provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in fire protection systems.

2.2 Dry Pipe: Galvanized ERW A135.

2.3 Wet Pipe: Black steel ERW A135.

2.4 Heads: All heads to be quick response.

3 EXECUTION

3.1 General: Examine areas and conditions under which fire protection materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer. Install the system per NFPA-13, and the requirements of the Authority Having Jurisdiction. Any installation, modification, or alteration of the sprinkler system shall be performed only by a person under a certificate of competency issued by the State Fire Marshal.

3.2 Fire Flow Test Data: Installation of new 12" water main to site has not been installed at this time.

Hydrant - Location unknown - verify with Lake City Planning.

Static pressure 50-55 psi expected.

Residual pressure unknown.

A flow test will be required to be performed under the Contractor's Engineer-of-Record's direction when new main has been installed.

3.3 All sprinkler heads in acoustical tile ceilings shall be installed in the center of the tile both ways.

3.4 All sprinklers in finished spaces shall utilize semi-recessed. Coordinate type with Architect.

3.5 Extra Stock:

3.5.1 Heads: For each style and temperature range required, furnish additional sprinkler heads, amounting to one unit for every 100 installed units, but not less than 5 units of each.

3.5.2 Wrenches: Furnish 2 spanner wrenches for each type and size of valve connection and

fire hose coupling. Obtain receipt from Owner that extra stock has been received.

3.6 Owner Instruction: Provide technical services for one 4-hour period to instruct Owner's personnel in operation and maintenance of building sprinkler systems. Schedule training date with Owner. Provide at least 7-day notice to Engineer and Owner of training date.

END OF SECTION

# SECTION 15405/POTABLE WATER SYSTEM

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Requirements and Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of potable water systems work, is indicated on drawings and schedules, and by requirements of this section.

1.4 Refer to appropriate Division-2 sections for exterior potable water system; not work of this section unless noted.

1.5 Insulation for potable water piping is specified in other Division-15 sections, and is included as work of this section. Insulation requirements include:

1.5.1 Domestic hot water piping

1.5.2 Cold water piping above ceilings and/or in attics outside insulated envelope of the building.

1.6 Excavation and backfill required in conjunction with water piping is specified in other Division-15 sections, and is included as work of this section.

1.7 Code Compliance: Comply with applicable portions of Standard Plumbing Code pertaining to selection and installation of plumbing materials and products. Comply with local utility requirements.

1.8 Approval Submittals:

1.8.1 Product Data: Submit manufacturer's technical product data and installation instructions for:

1.8.1.1 Valves

1.8.1.2 Strainers

1.8.1.3 Hose bibbs

1.8.1.4 Wall hydrants

1.8.1.5 Water hammer arresters

1.8.1.6 Backflow preventers

1.8.1.7 Meters and gauges

1.8.1.8 Relief valves

1.8.1.9 Trap primers

1.8.1.10 Access doors

1.9 Test Reports and Verification Submittals:

1.9.1 Backflow Preventer Test Report: Submit Test Report for each backflow preventer.

1.9.2 Disinfection: Submit report by Health Department.

1.10 O&M Data Submittals: Submit a copy of all approval submittals. Submit maintenance data and parts lists for valves, backflow preventers, trap primers. Include these data in O&M manual.

2 PRODUCTS

2.1 General: 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 Standard Plumbing Code where applicable. Provide sizes and types matching pipe materials used in potable water systems. Where more than one type of materials or products is indicated, selection is Installer's option.

2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following listed for each item.

2.3 Identification: Provide identification complying with Division-15 Basic Mechanical Materials and Methods section "Mechanical Identification".

2.4 Pipes and Fittings: Provide pipes and pipe fittings complying with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:

2.4.1 Interior Water Piping:

2.4.1.1 Above Grade: Copper tube; Type L, hard-drawn temper; wrought-copper fittings, solder-joints.

2.4.1.2 Below Grade: Copper tube; Type L, soft-annealed temper; no joints below floor.

2.4.2 Soldering Materials: Solders for domestic water service shall be NSF approved and tested to contain no impurities of lead.

2.4.2.1 Solder joints will be provided with a lead free filler material approved by NSF (National Sanitation Foundation) and in compliance with ANSI 61 suitable for domestic water

systems. Selection of solder may be made from the following list.

J.W. Harris Company, Inc.
Phone: 513-754-6142
Stay Brite, Stay Brite 8, Bridgit, NICK, and with limited use per manufacturers directions Stay-Silv 6HP.

Taracorp, Inc.
Phone 770-955-1445
Taramet Sterling, Tarasil 964, Tarasil 946, Soldersafe, Soldersafe with silver, or Dutchboy.

Solder paste will be non-toxic water based approved by NSF for use in domestic water systems. Solder paste shall meet ASTM B813. Solder paste shall be suitable for solder filler material used. Acid flux is prohibited. Use of solder materials not approved by NSF and not in compliance with ANSI 61 are prohibited.

2.5 Piping Specialties: Provide piping specialties complying with Division-15 Basic Mechanical Materials and Methods section "Piping Specialties".

2.6 Supports and Anchors: Provide supports and anchors complying with Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors".

2.7 Interior Valves: Provide valves complying with Division-15 Basic Mechanical Materials and Methods section "Valves", in accordance with the following listing:

2.7.1 Sectional and Shutoff Valves: BA1, BA2.

2.7.2 Drain Valves: BA1, BA2.

2.7.3 Check Valves: CK1, CK2, CK3.

2.8 Exterior Valves: Provide as indicated, gate valves, AWWA C500, 175 psi working pressure. Provide threaded, flanged, hub, or other end configurations to suit size of valve and piping connections. Provide inside screw type for use with curb valve box, iron body, bronze-mounted, double disc, parallel seat, non-rising stem. Clow Corp., Dresser Mfg., Fairbanks Co., Kennedy, Stockham.

2.9 Hose Bibbs: Provide rough nickel plated hose bibbs with lock shield compression stop and removable handle, solid flange, female connection with ¾" male threaded hose end, and straight line type non-removable vacuum breaker with ¾" male threaded hose end. Acorn 8121 RCP or equal model by Woodford.

2.10 Non-freeze Wall Hydrants: Provide ¾" anti-syphon, non-freeze wall hydrant with bronze casing, satin bronze box, straight inlet connection, and integral vacuum breaker-backflow preventer.

2.11 Water Hammer Arresters: Provide bellows type water hammer arresters, stainless steel casing and bellows, pressure rated for 250 psi, tested and certified in accordance with

PDI Standard WH-201. Precision Plumbing Products, Josam, Zurn, Amtrol, Wade, Jay R. Smith, or approved equal.

2.12 Backflow Preventers: Provide reduced pressure principle backflow preventers consisting of a complete assembly including shutoff valves on inlet and outlet and strainer on inlet. Backflow preventers shall include test cocks and pressure-differential relief valve located between 2 positive seating check valves. Construct in accordance with ASSE Standard 1013. Febco Sales, Hersey, Lawler, Watts, or approved equal. Comply with local utility requirements.

2.13 Meters and Gauges: Provide meters and gauges complying with Division-15 Basic Mechanical Materials and Methods section "Meters and Gauges", in accordance with the following listing:

2.13.1 Thermometers

2.13.2 Pressure gauges

2.14 Combined Pressure-Temperature Relief Valves: Provide relief valves as indicated, of size and capacity as selected by Installer for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code. Provide bronze body, test lever and thermostat complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210°F, and pressure relief at 150 psi. Watts, Cash, Zurn, or approved equal.

2.15 Trap Primers: Provide brass trap primers and distribution units to seal floor drains indicated on drawings. Trap primer valves shall be automatic, self contained type with no springs or diaphragms and shall not require adjustment. Trap primer valves shall be the type that can be installed anywhere on cold water piping. Distribution units shall supply 1-4 floor drains. Trap primer valves shall comply with ASSE 1018. Precision Plumbing Products PR-500, or approved equal. Where P-trap primers are indicated use "Prime-Eze" by Jay R. Smith, or approved equal.

2.16 Access Doors: Provide access doors to service all valves and other devices as required in accordance with Division-15 Basic Materials and Methods Section "Access Doors".

3 EXECUTION

3.1 General: Examine areas and conditions under which potable water systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 Install mechanical identification in accordance with Division-15 Basic Mechanical Materials and Methods section "Mechanical Identification". Install underground plastic pipe markers during backfill, 6"-8" below grade.

3.3 Install water distribution piping in accordance with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".

3.3.1 Install piping with 1/32" per foot (¼%) downward slope towards drain point.

3.3.2 Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

3.4 Install piping specialties in accordance with Division-15 Basic Mechanical Materials and Methods section "Piping Specialties".

3.5 Install supports and anchors in accordance with Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors".

3.6 Install valves in accordance with Division-15 Basic Mechanical Materials and Methods section "Valves".

3.6.1 Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves two or more plumbing fixtures or equipment connections, and elsewhere as indicated.

3.6.2 Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.

3.6.3 Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain potable water system.

3.6.4 Check Valves: Install where indicated.

3.7 Hose Bibbs and Wall Hydrants: Install on concealed piping where indicated with vacuum breaker. Mount 18 inches above grade or finished floor.

3.8 Install backflow preventers where indicated, and where required by Standard Plumbing Code. Locate in same room as equipment being protected. Pipe relief outlet to nearest floor drain or outside as shown on the drawings. Provide test and report by State of Florida Certified Backflow Preventer Specialist.

3.9 Install meters and gauges in accordance with Division-15 Basic Mechanical Materials and Methods section "Meters and Gauges".

3.10 Install relief valves on each water heater, and where indicated in accordance with the manufacturer's instructions. Pipe full size outside or to floor drain. Cut the end of the pipe at a 45° angle and terminate 6 inches above the floor or grade.

3.11 Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by Standard Plumbing Code.

3.12 Install water hammer arresters in upright position, in locations and of sizes indicated in accordance with PDI Standard WH-201.

3.13 Install air chambers at each fixture (or group of fixtures if the farthest fixture is within 6 feet of an air chamber). Air chambers shall be 20 pipe diameters long, but in no case less than 12 inches long.

3.14 Install trap primers as indicated, and in accordance with manufacturer's installation instructions. Provide access panels to all trap primers unless accessible through a lay-in ceiling.

3.15 Locate and coordinate installation of access doors for all valves and devices in accordance with Division-15 Basic Mechanical Materials and Methods section "Access Doors".

3.16 Piping Tests: Test, clean, and sterilize potable water piping in accordance with testing requirements of Division-15 Basic Mechanical Materials and Methods section "Testing, Cleaning, and Sterilization of Piping Systems".

END OF SECTION

# SECTION 15410/SOIL, WASTE AND VENT SYSTEM

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Requirements and Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of soil waste and vent systems work is indicated on drawings and schedules, and by requirements of this section.

1.4 Refer to appropriate Division-2 sections for exterior sanitary sewer system required in conjunction with soil and waste systems; not work of this section.

1.5 Insulation for soil and waste systems is specified in other Division-15 sections, and is included as work of this section. Insulation requirements include:

1.5.1 Horizontal above grade waste pipes receiving discharge from coolers or similar units to points of connection receiving waste from 4 or more fixtures.

1.5.2 Horizontal above grade waste pipes receiving condensate from air conditioning equipment to point of connection receiving waste from 4 or more fixtures.

1.6 Excavation and backfill required in conjunction with soil, waste and vent piping is specified in other Division-15 sections and is included as work of this section.

1.7 Refer to Division-7 section "Flashing and Sheet Metal" for flashings required in conjunction with soil and waste systems; not work of this section.

1.8 Code Compliance: Comply with applicable portions of Standard Plumbing Code pertaining to plumbing materials, construction and installation of products. Comply with local utility requirements.

1.9 Approval Submittals:

1.9.1 Product Data: Submit manufacturer's technical product data for:

1.9.1.1 Cleanouts

1.9.1.2 Floor drains

1.10 O&M Data Submittals: Submit a copy of all approval submittals. Submit maintenance data and parts lists for oil separators and backwater valves. Include these data in O&M manual.

## 2 PRODUCTS

2.1 General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in soil and waste systems. Where more than one type of materials or products is indicated, selection is Installer's option.

Underground-Type Plastic Line Marker: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide green tape with black printing reading "CAUTION SEWER LINE BURIED BELOW".

2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following listed for each item.

2.3 Pipes and Fittings: Provide pipes and pipe fittings complying with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:

2.3.1 Above Ground Soil, Waste, and Vent Piping:

2.3.1.1 Copper tube; Type DWV; Cast-bronze fittings, drainage pattern, 50-50 solder-joint. Use for waste arms only. Connections to tapped cast iron fittings shall be made with C X MPT DWV soil pipe adapters. Connections to hub-cast iron fittings shall be made with C X SPIGOT DWV soil pipe adapters. Connections to no hub cast-iron fittings shall be made with C X NO HUB DWV soil pipe adapters.

2.3.1.2 Cast-iron hub-and-spigot soil pipe; service weight; cast-iron hub-and-spigot soil pipe fittings, lead and oakum joints.

2.3.1.3 Cast-iron hub-and-spigot soil pipe; cast-iron hub-and-spigot soil pipe fittings, compression gasket joints.

2.3.1.4 Hubless cast-iron soil pipe; service weight; hubless cast-iron soil pipe fittings, hubless joints.

2.3.1.5 Polyvinyl chloride plastic pipe (PVC); Type DWV; PVC plastic type DWV socket-type fitting, solvent cement joints. Do not use in fire-rated assemblies or return air plenums.

2.3.2 Underground Building Drain Piping:

2.3.2.1 Cast-iron hub-and-spigot soil pipe; service weight; cast-iron hub-and-spigot soil pipe fittings, lead and oakum joints.

2.3.2.2 Cast-iron hub-and-spigot soil pipe; cast-iron hub-and-spigot soil pipe fittings, compression gasket joints.

2.3.2.3 Pipe Size 6" and Smaller: Polyvinyl chloride sewer pipe (PVC); Type DWV; PVC plastic type DWV socket-type.

2.4 Pipe Specialties: Provide piping specialties complying with Division-15 Basic Materials and Methods section "Piping Specialties".

2.5 Supports and Anchors: Provide supports and anchors complying with Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors".

2.6 Cleanouts: Provide factory-fabricated drainage piping products of size and type indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and governing regulations. Josam, Jay R. Smith, Wade, Zurn.

2.6.1 Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1 countersunk head.

2.6.2 Cleanouts for Cast-Iron Piping Systems:

2.6.2.1 Floor Cleanouts: Cast-iron body with adjustable head, brass plug, and scoriated nickel-brass cover. Furnish with carpet marker style for carpeted floors. Furnish with recessed cover for tile floors. Furnish with clamping ring for floors with waterproof membrane. Wade W-6000 spigot outlet for Ty-Seal hub, W-6010 inside caulk, or W-6030 hub outlet for push-on as required.

2.6.2.2 Cleanouts in Piping: Cast-iron cleanout ferrule with threaded brass countersunk plug for caulked piping, Wade W-8550-D. For no-hub piping, furnish no-hub ferrule with W-8590-D threaded brass countersunk plug.

2.6.2.3 Wall Cleanouts: Cast-iron ferrule with tapped, countersunk, threaded brass plug and round stainless steel access cover with screw. Wade W-8450-R for caulked joints. No-hub ferrule, Wade-8590-E plug, and Wade W-8480 cover for no-hub joints.

2.6.2.4 Grade Cleanouts: Cast-iron cleanout ferrule with threaded brass countersunk plug. Wade W-8530-D. In sidewalks and other finished concrete, provide access cover frames with a non-tilting tractor cover. Wade W-7035-Z or equal.

2.6.2.5 Cleanouts in Paved Areas: Cast iron body, adjustable housing, ferrule with plug and round loose scoriated tractor cover. Wade W-8300-MF. Coordinate concrete depth at site with adjustable flange.

2.6.3 Cleanout for PVC Systems:

2.6.3.1 Floor Cleanouts: Cast-iron body with adjustable head, brass plug, and scoriated nick-brass cover. Furnish with carpet marker style for carpeted floors. Furnish with recessed cover for tile floors. Furnish with clamping ring for floors with membrane. Wade W-6030 hub outlet for push-on.

2.6.3.2 Cleanouts in Piping: PVC cleanout adaptor with threaded PVC plug.

2.6.3.3 Wall Cleanouts: PVC cleanout adaptor with tapped, countersunk, threaded brass plug and round stainless steel access cover with screw. Wade W-840-R-75. Add same as above here.

2.6.3.4 Grade Cleanouts: PVC cleanout adaptor with countersunk, threaded brass plug. Wade W-8590-D plug. In sidewalks and other finished concrete, provide access cover frames with a non-tilting tractor cover. Wade W-7035-Z or equal.

2.6.3.5 Cleanouts in Paved Areas: Cast iron body, adjustable housing, ferrule with plug and round loose scoriated tractor cover. Wade W-8300-MF. Coordinate concrete depth at site with adjustable flange.

2.7 Floor Drains: Provide floor drains of size as indicated on drawings; and type, including features, as specified herein. Josam, Jay R. Smith, Wade, Zurn.

2.7.1 Floor Drains: Provide inside caulk bottom outlet or TY-Seal hub outlet with adaptor for cast iron trap installation and a 4" deep trap seal. Provide clamping rings for floors with membrane.

2.7.2 Strainer: Provide 5" satin-nickel bronze strainer.

2.7.3 Trap Primer Connection: Provide ½" trap primer tapping.

2.7.4 Funnel: Provide funnel where shown on the drawings.

2.7.5 Basis of Design: Wade Series 1100.

3 EXECUTION

3.1 Examine substrates and conditions under which soil and waste systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 Piping Installation:

3.2.1 Install above grade soil and waste piping in accordance with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", and with Standard Plumbing Code.

3.2.2 Install underground soil and waste pipes as indicated and in accordance with Standard Plumbing Code. Lay underground piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

3.2.3 Install building soil and vent piping pitched to drain at minimum slope of ¼" per foot (2%) for piping 3" and smaller, and 1/8" per foot (1%) for piping 4" and larger.

3.3 Install piping specialties in accordance with Division-15 Basic Mechanical Materials and Methods section "Piping Specialties".

3.4 Install supports and anchors in accordance with Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors".

3.5 Installation of Cleanouts: Install in above ground piping and building drain piping as indicated, as required by Standard Plumbing Code; and at each change in direction of piping greater than 45°; at minimum intervals of 50' for piping 4" and smaller and 100' for larger piping; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.

3.5.1 Size: Cleanouts shall be full size up to 4". Piping over 4" shall have a reducing fitting to accommodate a 4" cleanout unless indicated otherwise on drawings.

3.5.2 Install cleanouts to allow adequate clearance for rodding.

3.5.3 Protect all finished surfaces of cleanouts with a suitable adhesive covering until construction is completed.

3.5.4 Cleanouts to Grade: Provide an 18" x 18" x 8" thick concrete pad around the cleanout. Set the cleanout ferrule, adapter, or access cover frame in the concrete as required. The cleanout shall be extended to the finished grade. The concrete pad shall slope away from the cleanout in all directions approximately one inch. Cover pad with fill to finished grade.

3.5.5 Cleanouts in Paved Areas: Provide concrete pad similar to cleanout to grade and coordinate concrete depth at site with adjustable flange. Access cover frames are required.

3.6 Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membranes.

3.7 Vent Flashing Sleeves: Install on stack passing through roof, secure to stack flashing in accordance with manufacturer's instructions. For metal roofs, sleeves and flashing are by Division-7.

3.8 Installation of Floor Drains: Install floor drains in accordance with manufacturer's written instructions and in locations indicated.

3.8.1 Coordinate flashing work with work of waterproofing and adjoining substrate work.

3.8.2 Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.

3.8.3 Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

3.8.4 Position drains so that they are accessible and easy to maintain.

3.9 Connection of Trap Primers: Connect trap primers as indicated, and in accordance with manufacturer's installation instructions. Pitch piping towards drain trap, minimum of 1/8" per foot (1%). Adjust trap primer for proper flow.

3.10 Piping Runouts to Fixtures: Provide soil and waste piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated, but in no case smaller than required by Standard Plumbing Code.

3.11 Test, clean, flush, and inspect soil and waste piping in accordance with requirements of Division-15 Basic Mechanical Materials and Methods section "Testing, Cleaning and Sterilization of Piping Systems".

3.12 Smoke Test of Pipe System: Smoke test the entire sanitary and vent system. Testing shall be made at two times (once during below-grade work and once prior to installation of plumbing fixtures). Cap all system openings including vent stacks, floor drains, floor sinks, stacks, cleanouts, and end of sanitary main at site connection point. Place smoke tablet into pipe so that pipe is not damaged. After a period of time and after the tablet has produced smoke, inspect all piping. Inspect pipe joints but place emphasis on inspecting the entire pipe system. For piping in concealed areas provide smoke testing and inspection prior to concealment. Request in writing (with date and time) through the General Contractor a minimum of two days prior to the test in order that the and Architect may witness the testing.

END OF SECTION

SECTION 15430/PLUMBING FIXTURES, EQUIPMENT, TRIM & SCHEDULE

1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Requirements and Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of plumbing fixtures work required by this section is indicated on drawings and schedules, and by requirements of this section.

1.4 Refer to Division-16 sections for field-installed electrical wiring required for plumbing fixtures; not work of this section.

1.5 Codes and Standards:

1.5.1 Plumbing Fixture Standards: Comply with applicable portions of Standard Plumbing Code pertaining to materials and installation of plumbing fixtures.

1.5.2 ANSI Standards: Comply with applicable ANSI standards pertaining to plumbing fixtures and systems.

1.5.3 PDI Compliance: Comply with standards established by PDI pertaining to plumbing fixture supports.

1.5.4 UL Listing: Construct plumbing fixtures requiring electrical power in accordance with UL standards and provide UL-listing and label.

1.5.5 ARI Compliance: Construct and install water coolers in accordance with ARI Standard 1010 "Drinking-Fountains and Self-Contained Mechanically-Refrigerated Drinking-Water Coolers", and provide Certification Symbol.

1.5.6 ANSI Compliance: Construct and install barrier-free plumbing fixtures in accordance with ANSI Standard A117.1 "Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People".

1.6 Approval Submittals:

1.6.1 Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, furnished specialties and accessories; and installation instructions. Submit manufacturer's assembly-type drawings indicating dimensions, roughing-in requirements, required clearances, and methods of assembly of components and anchorages. The submittal shall be organized by "fixture number" and each fixture package shall be so identified. Each fixture package shall include all of the required fitting and trim, even if such devices are used for more than one fixture.

1.7 O&M Data Submittals: Submit a copy of approval submittals. Submit maintenance data

are indicated. Waste outlets shall be full size of fixture drain connection.

2.5.3.1 Provide chrome-plated cast-brass P-traps and drains with cleanout.

2.5.3.2 P-traps, wastes and drains of all types shall be 17-gauge.

2.5.3.3 Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. McGuire, or approved equal.

2.5.4 Flush Valves: Provide quiet-flush, chrome-plated, cast-brass flush valves with vacuum breaker and screwdriver stop. Where handicap service is indicated, provide ADA compliant handles with the handle on the wide side of the stall.

2.5.4.1 Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. Sloan Valve Co., Delany Co.

2.5.5 Carriers: Provide cast-iron supports for fixtures of either graphitic gray iron, ductile iron, or malleable iron or steel as indicated. Coordinate with specific fixture requirements and conditions of the project.

2.5.5.1 Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. Josam, Wade, MiFAB, J.R. Smith.

2.5.6 Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.

2.5.7 Escutcheons: Where fixture supplies and drains penetrate walls in exposed locations, provide chrome-plated brass sheet steel escutcheons with friction clips.

2.5.8 Comply with additional fixture requirements listed for each fixture and as required for a complete and functional system.

3 SCHEDULE

3.1 P-1A Water Closet, Floor-Mounted: Vitreous china, elongated, siphon jet, white, water saver bowl (1.6 gallon per flush) with 1½" top spud, 14-1/8" rim height. Exposed chrome-plated flush valve, with screwdriver stop, vacuum breaker and quiet flush feature, integral bedpan lug water saver bowl. Heavy molded plastic, white elongated, closed front seat with cover, with stainless steel, self-sustaining check hinges. Provide wall-mounted bedpan washer assembly (cold water only) with hand control valve, volume control, integral stop, vacuum breaker, 5 feet white pvc hose, wall hook and spray head. Vacuum breaker for bedpan washer shall withstand continuous pressure without spillage.

(Select right or left operator, operator to wide side of room space.)

| | |
|---|---|
| Water Closet | American Standard 2234.015 |
| Valve | Sloan Royal #111 |
| Seat | Sperzel 50-EWSSCH |
| Closet Carrier | J.R. Smith 0410 |
| Bed Pan Washer | T&S B-0678 |

3.2 P-1B Water Closet,Floor-Mounted (Handicap): Vitreous china, elongated, siphon jet, white, water saver bowl (1.6 gallon per flush) with 1½" top spud, 17" rim height. Exposed chrome-plated flush valve, with screwdriver stop, vacuum breaker and quiet flush feature, integral bedpan lug water saver bowl. Heavy molded plastic, white elongated, closed front seat with cover, with stainless steel, self-sustaining check hinges. Provide wall-mounted bedpan washer assembly (cold water only) with hand control valve, volume control, integral stop, vacuum breaker, 5 feet white pvc hose, wall hook and spray head. Vacuum breaker for bedpan washer shall withstand continuous pressure without spillage.

(Select right or left operator, operator to wide side of room space.)

| | |
|---|---|
| Water Closet | American Standard 3043.102 |
| Valve | Sloan Royal #111 |
| Seat | Sperzel 50-EWSSCH |
| Closet Carrier | J.R. Smith 0410 |
| Bed Pan Washer | T&S B-0678 |

3.3 P-1C Water Closet, Floor-Mounted: Vitreous china, elongated, siphon jet, white, water saver bowl (1.6 gallon per flush) with 1½" top spud, 14-1/8" rim height. Exposed chrome-plated flush valve, with screwdriver stop, vacuum breaker and quiet flush feature. Heavy molded plastic, white elongated, open front seat less cover, with stainless steel, self-sustaining check hinges.

| | |
|---|---|
| Water Closet | American Standard 2234.015 |
| Valve | Sloan Royal 111 |
| Seat | Sperzel 50-EWSSCH |

3.3 P-1D Water Closet, Floor-Mounted (Handicap-Adult): ADA compliant, vitreous china, elongated, siphon jet, white, water saver bowl (1.6 gallon per flush) with 1½" top spud. Exposed chrome-plated flush valve with extra long handle, with screwdriver stop, vacuum breaker and quiet flush feature. Heavy molded plastic, white elongated, open front seat less cover, with stainless steel, self-sustaining check hinges, 17-7/16" high to top of seat (17" rim height).

| | |
|---|---|
| Water Closet | American Standard 3043.102 |
| Valve | Sloan Royal 111 |
| Seat | Sperzel 50-EWSSCH |

3.4 P-2A Lavatory, Counter-Mounted: White vitreous china, 20"x17" oval, self-rimming for counter top installation, for a 4" center set, integral perforated strainer with 1-1/4" tailpiece, chrome-plated 17-gauge cast-brass P-trap with cleanout. Provide single lever centerset hot and cold water faucet. Provide pop-up drain. Chrome-plated angle stops to wall with chrome-plated 3/8" flexible supply. Provide handicap drain and supply insulation, McGuire Pro Wrap Kit PW-2150WC.

| | |
|---|---|
| Lavatory | American Standard 0475.047 (4"center set) |
| Fitting | Symmons S-20-2-LP (for pop-up drain) |
| Supply w/stop | McGuire 165 |
| P-Trap | McGuire 8872 |

3.5 P-2B Lavatory, Counter-Mounted-Handicap Accessible: White vitreous china, 20"x17"

| | |
|---|---|
| P-Trap | McGuire 8912 |

3.14 P-6C Single Compartment Stainless Steel Sink (Isolation): 22"x22"x10" deep, Type 302, 18-gauge self-rimming single compartment, stainless steel back ledge sink with No. 4 finish and sound deadening material on sides and bottom of sink. Provide ADA compliant sensor operated electronic 8" center set gooseneck faucet. Faucet shall be provided with a U.L listed plug in type step down voltage transformer for operating power, a built in filter, check valves, manual override feature and above counter hot - cold mixer. Divison 16 will provide a GFI receptacle below the countertop. Provide chrome-plated brass strainer with grid drain and 1-1/2" tailpiece, 1½" C.P. cast-brass P-trap with cleanout, angle stops to wall with ⅜" flexible supplies.

| | |
|---|---|
| Sink | Elkay #DLR-2222-10 for 8" centerset faucet |
| Faucet | Speakman S-8039 |
| Supply | McGuire 165 |
| Grid Strainer | Elkay LK-18 |
| P-Trap | McGuire 8912 |

3.15 P-6D Single Compartment Stainless Steel Sink (Nutrition): 15"x15"x7" deep, Type 302, 18-gauge self-rimming single compartment, stainless steel back ledge sink with No. 4 finish and sound deadening material on sides and bottom of sink. Provide brass, single hole, swing spout, double wing handle faucet. Provide chrome-plated brass strainer with grid drain and 1-1/2" tailpiece, 1½" C.P. cast-brass P-trap with cleanout, angle stops to wall with ⅜" flexible supplies.

| | |
|---|---|
| Sink | Elkay #BLR-150-C for single hole faucet |
| Faucet | ELKAY LK-2223 |
| Supply | McGuire 165 |
| Grid Strainer | Elkay LK-36 |
| P-Trap | McGuire 8912 |

3.16 P-7 Double Compartment Stainless Steel Sink: 33"x22"x10" deep, Type 302, 18-gauge self-rimming, double-compartment, stainless steel, back ledge sink with No. 4 finish and sound deadening material on sides and bottom of sink. Provide hot and cold water combination supply fitting, lever handles, swing gooseneck faucet with spray head. Provide grid strainer with 1½" tailpiece, 1½" C.P. continuous drain, 1½" C.P. cast-brass P-trap with cleanout, loose key angle stops to wall with ⅜" flexible supplies.

| | |
|---|---|
| Sink | Elkay DLR-3322-10 |
| Grid Strainers (2 required) | Elkay LK-18 |
| Faucet with spray | T&S B-2347 w/ B199-06 VP& 4" wrist blades |
| Cont. Waste | Elkay LK-53 |
| Supplies | McGuire 165LK |
| P-Trap | McGuire 8912 |

3.17 P-8 Triple Compartment Stainless Steel Sink: This scullery type custom fabricated two-compartment stainless steel sink including integral drainboards and including two (2) lever waste with overflows and one (1) faucet with swing spout will be provided under Division 11400 of these specifications. Install all required plumbing trim and put sink in service. Fabricate continuous waste (indirect waste) from two-compartment sink to the

floor sink using standard cast brass drainage fittings. Refer to notes on drawings for anchoring piping to the sink unit. Provide angle stops to wall with ½" flexible risers.

3.18 P-9 Electric Water Cooler: ADA compliant, wall-hung self-contained stainless steel finish electric water cooler. Unit to be complete with hermetic air cooled refrigeration system, cooler, pre-cooler, thermostat, safety controls, condenser fan motor, vermin-proof insulation, stainless steel cabinet, quiet operation. Top of cooler shall be No. 4 finish stainless steel cooler capacity 5 gph, cooling 80°F to 50°F and one year warranty on entire cooler. Provide chrome-plated stop to wall with chrome-plated ⅜" flexible supply. Provide preinsulated 1¼" chrome-plated 17-gauge cast-brass P-trap with cleanout. Submittal must indicate that fountain and bubbler meet requirements of ADA. Provide short foot carrier for water cooler. Mount with top of cooler 26" above finished floor.

| | |
|---|---|
| Electric Water Cooler | Elkay LZS8-F w/ Glass Filler |
| Glass Filler | Elkay LK 1110 |
| P-Trap with Prewrap Insulation | McGuire 8872 w/ Prowrap |
| Supply w/Stop | McGuire 165 |
| Carrier | J.R. Smith 834 |

3.19 P-10 Clothes Washer Wallbox: Provide a top supply washing machine supply and 2" drain connector. Make final connections to washing machine. Provide hose & hose strainers if not supplied with washer.

| | |
|---|---|
| Supply & Drain Unit | Guy Gray Model FBB 200TS |

3.20 P-11 Laundry Tray (In Cabinet): 25"x22"x12" deep, Type 302, 18-gauge self-rimming single compartment, stainless steel back ledge sink with No. 4 finish and sound deadening material on sides and bottom of sink. Provide top-mount dual lever hot & cold water supply fitting with swivel gooseneck with water saving aerator, chrome-plated brass strainer with removable crumb cup stopper and 1-1/2" tailpiece, 1½" C.P. cast-brass P-trap with cleanout, angle stops to wall with ⅜" flexible supplies.

| | |
|---|---|
| Sink | Elkay #DLR-2522-12 (8"ctr.) |
| Faucet | T&S B-2855 w/ 4"wrist blades |
| Supply | McGuire 165 |
| Grid Strainer | Elkay LK-35 |
| P-Trap | McGuire 8912 |

3.21 P-12 Clinic Service Sink: Pedestal mounted 20-1/2" x 27" vitreous china, siphon jet flushing action, flushing rim with three-section rim guard, 1-1/2" top spud 4" floor outlet, stainless steel coverplates. Provide wall-mounted service sink faucet with wall brace, 6" elbow handles, 14-3/4" wall to spout outlet. Provide exposed chrome-plated 1" offset flush valve with screw driver stop, vacuum breaker and quiet flush feature. Provide hot and cold water bed pan cleanser assembly with elevated vacuum breaker, nozzle with hook, wall-mounted double pedal valve, heavy duty white rubber hose with extended spray outlet. Refer to architectural drawings and specifications for pedestal.

| | |
|---|---|
| Clinic Sink | Eljer 241-0270 |
| Rim Guards | Eljer 805-0210 & 805-0215 |

| | |
|---|---|
| Wall Faucet | T&S B-0651-POL w/ BWH 6" handles |
| 1" Offset Flush Valve | Sloan 1171-10 with 1" Offset |
| Bedpan Cleanser | T&S B-0675 |

3.22 P-13 Mop Receptor: One piece precast terrazzo mop service basin 36"x36"x12" neo corner model 12" high with stainless steel caps on all shoulders, shoulders 2" wide. 3" integral grid drain stainless steel. provide C.P. combination wall mount faucet with arm handles, stops, vacuum breaker, hose connection, 30" hose and hose bracket. If wall surrounding mop receptor is not provided with tile, provide stainless steel wall guard.

| | |
|---|---|
| Mop Receptor | Fiat TSBC- 1612 |
| Faucet | Fiat 830-AA |
| Hose & Bracket | Fiat 832-AA |

3.23 P-14 Dishwasher: This conveyor type dishwasher with chemical rinse will be provided under Division 11400 of these specifications. Provide all required plumbing trim and put dishwasher in service. Provide water hammer arrester, pressure reducing valve, and flow regulating plug cock. Coordinate with Division 16 (Electrical) and provide all necessary interconnections between dishwasher and electric booster water heater / chemical rinse devices and verify both are functioning properly.

3.24 P-15 Ice Maker Kit: 6" x 6" x 3-1/2" plastic recessed wall box with wall flange, compression valve with brass seat installed through box. Provide approximately 10 linear feet 1/4" O.D. soft copper with compression fitting in tight coil.

| | |
|---|---|
| Valve and Box | C.P. Industries 9000 |

3.25 P-16 Floor Sink: Square top, stainless steel, round sump with stainless steel wire sediment basket and beehive dome strainer. Provide unit without grate for concealed locations under equipment and with full grate at exposed applications. Top of floor sink shall be flush with finished floor to serve as floor drain as well as equipment drain. Provide grate with opening for equipment drain. Install equipment drains to floor sinks to prevent splashing and provide air gap per code.

| | |
|---|---|
| Floor Sink | J.R. Smith 3008 3" Size |

3.26 P-17 Combination Oven/Steamer: This free-standing oven/steamer will be furnished under Division 11400 of these specifications. Connect ¾" valved copper cold water piping to unit and 1½" copper indirect waste from unit drain to floor sink. Put unit in service. Refer to gas piping schematic on drawings for gas connections.

3.27 P-18 Range: Range will be furnished under Division 11400 of these specifications. Put unit in service. Refer to gas piping schematic on drawings for gas connections.

3.28 P-19 Ice Machine: Ice machine will be furnished under Division 11400 of these specifications. Install all required plumbing and put ice machine in service. Provide 1/2" F.P.T. cold water connection to ice making water inlet from filter. Install filter unit (furnished with the ice machine) on the wall and ½" cold water piping to the filter with ball valve. Connect ½" F.P.T. to ice making water drain. Provide ¾" copper piping indirect waste piping from this ½" connection to the floor drain funnel. Connect separate ¾"

F.P.T. to bin drain and provide ¾" copper indirect waste to the floor drain funnel. Wastes shall not be connected together. Use only drainage fittings, soldered. Provide cleanouts. Insulate with 1" foamed plastic to prevent sweating. Anchor waste piping to unit. Provide 6" x 6" x 3½" plastic recessed wall box with wall flange, compression valve with brass seat installed through box (refer to Fixture P-27). Provide approximately 10 linear feet 1/2" O.D. soft copper with compression fitting in tight coil.

| | |
|---|---|
| Valve and Box | C.P. Industries 9000 |

3.29 P-20 Hot and Cold Water Faucet: Provide C.P. combination wall mount faucet with arm handles, stops, vacuum breaker and hose connection.

| | |
|---|---|
| Faucet | T&S B - 0674 - BSTP |

3.30 P-21A Electric Water Heater (100 Gallon): Point-of-Use commercial tan type with glass-lined tank suitable for 150 psi working pressure, 300 psi test. Finish of durable high gloss baked enamel, white. Blanket glass fiber over entire tank. ASME pressure and temperature relief valve. Provide five (5) year warranty, snap action automatic surface-mounted thermostats, dual immersion type heating elements and magnesium anode rod. Provide inlet shut-off valve, vacuum relief valve (Watts 36A) on inlet water supply, thermostatic mixing valve complete with integral check stops, dial thermometer volume control shut-off valve, thermal expansion tank specifically designed for potable hot water systems.

| | |
|---|---|
| Electric Water Heater | O. A. Smith DSED-100, 60KW Watts , 208 Volt, Three Phase (Simultaneous Wiring) |
| Thermal Expansion Tank | Amitrol Therm-X-Trol ST-25 |

3.12 P-21B Electric Water Heater (30 Gallon): Point-of-Use tank type with glass-lined tank suitable for 150 psi working pressure, 300 psi test. Finish of durable high gloss baked enamel, white. Blanket glass fiber over entire tank. ASME pressure and temperature relief valve. Provide five (5) year warranty, snap action automatic surface-mounted thermostats, dual immersion type heating elements and magnesium anode rod, simultaneous. Provide inlet shut-off valve, vacuum relief valve (Watts 36A) on inlet water supply, thermal expansion tank specifically designed for potable hot water systems, galvanized steel wall support stand and galvanized steel safety drip pan.

| | |
|---|---|
| Electric Water Heater | O. A. Smith, PEST-30D, 4500 Watts, 208 Volt, Single Phase (Dual Element) |
| Thermal Expansion Tank | Amitrol Therm-X-Trol ST-5 |
| Thermostatic Mixing Valve | Symmons 5-200A |

3.31 P-22 Thermostatic Mixing Valve: Provide high-low assembly with 3/4" inlets, 1" outlet. (IPS) furnished with large type thermostatic water mixing valve with solid bimetallic thermostat directly linked to valve porting, adjustable limit stop, inlet union, angle strainer check stops, outlet volume control/ shutoff, with pressure gauges, small thermostatic water mixing valve, integral check stops, thermostat, adjustable limit stop, wall support, outlet volume control/shutoff, dial thermometer (range 0-140 degrees °F), rough bronze finish. Inlet piping manifold with unions. Factory tested and assembled.

Valve Assembly Bradley S59-3080

3.32 P-23 Coffee Maker: Coffee makers will be furnished under Division 11400 of these specifications. Provide two ½" x 1/4" stops at location indicated, provide 5' of 1/4" tubing in a coil and furnish tubing ends as required to connect and set into service.

4 EXECUTION

4.1 Examine roughing-in work of potable water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

4.2 Install plumbing fixtures of types indicated where shown and at indicated heights. Install in accordance with fixture manufacturer's written instructions, roughing-in drawings, and with recognized industry practices. Install in accordance with ADA and applicable handicap code requirements. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of Standard Plumbing Code pertaining to installation of plumbing fixtures. Furnish templates for cut-outs in countertops. Coordinate exact fixture locations with countertop shop drawings.

4.3 Fasten plumbing fixtures securely to indicated supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies behind or within wall construction so as to be rigid, and not subject to pull or push movement. Mount at heights shown on the drawings. Fixture heights are floor-to-rim distance. Fitting heights are to centerline.

4.4 Install stop valve in water supply to each fixture.

4.5 After fixtures are set, the crack between the fixture and wall shall be caulked with DAP silicone-based caulking, or approved equal.

4.6 Protect installed fixtures from damage during remainder of construction period.

4.7 Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

4.8 Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect/Engineer. Remove cracked or dented units and replace with new units.

4.9 Clean plumbing fixtures, trim, aerators, and strainers of dirt and debris upon completion of installation.

4.10 Adjust water pressure at drinking fountains, faucets, and flush valves to provide proper

flow stream and specified gpm.

4.11 Adjust or replace washers to prevent leaks at faucets and stops.

END OF SECTION

SECTION 15440/GAS SYSTEM

1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Requirements and Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of gas systems work, is indicated on drawings and schedules, and by requirements of this section.

1.4 Excavation and backfill required in conjunction with gas service piping is specified in Division-15 sections, and is included as work of this section.

1.5 Codes and Standards

1.5.1 NFPA Compliance: Fabricate and install gas systems in accordance with NFPA 54 "National Fuel Gas Code". Provide LP gas storage and handling equipment in accordance with NFPA 58 "Standard for Storage and Handling of Liquified Petroleum Gases".

1.5.2 Utility Compliance: Fabricate and install gas systems in accordance with local gas utility company requirements and standards.

1.6 Approval Submittals:

1.6.1 Product Data: Submit manufacturer's technical product data and installation instructions as follows:

1.6.1.1 Gas cocks and/or ball valves

1.6.1.2 Master gas control valve

1.6.1.3 LP gas storage tanks

1.6.1.4 Gas regulators

1.6.1.5 Kitchen gas appliance connectors.

1.6.1.6 Gas appliance connectors.

1.6.1.7 Access doors

1.7 O&M Data Submittals: Submit a copy of approval submittals. Submit maintenance data and parts lists for gas cocks, ball valves, control valves, appliance connectors, gas vents, LP storage tanks, regulators. Include these data in O&M manual.

2 PRODUCTS

2.1 General: Provide piping materials and factory-fabricated piping products of sizes, types,

pressure 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 NFPA 54 where applicable. Base pressure rating on gas piping system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in gas systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2.2 Identification: Provide identification complying with Division-15 Basic Mechanical Materials and Methods section "Mechanical Identification".

2.3 Pipes and Fittings: Provide pipes and pipe fittings complying with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:

2.3.1 Gas Service Piping:

2.3.1.1 All Pipe Sizes: Black steel pipe; Schedule 40; wrought-steel buttwelding fittings.

2.3.1.2 Wrapping: Machine wrap pipe using 50% overlap wrap, with polyvinyl chloride tape. Hand wrap fittings using 100% overlap wrap extending 6" beyond fitting onto wrapped pipe. Comply with tape manufacturer's installation instructions.

2.3.1.3 Pipe Sizes ½" Through 12": Thermoplastic gas pressure pipe, tubing, and fittings complying with ASTM D 2513. Provide trace wire.

2.3.1.4 Pipe Sizes 2" Through 12": Reinforced epoxy resin gas pressure pipe and fittings complying with ASTM D 2517.

2.3.2 Building Distribution Piping:

2.3.2.1 Pipe Size 2" and Smaller: Black steel pipe; Schedule 40; malleable-iron threaded fittings.

2.3.2.2 Pipe Size 2½" and Larger: Black steel pipe; Schedule 40; wrought-steel buttwelding fittings.

2.4 Piping Specialties: Provide piping specialties complying with Division-15 Basic Mechanical Materials and Methods section "Piping Specialties".

2.5 Sealants: Provide UL-listed or AGA approved sealants for gas piping.

2.6 Supports and Anchors: Provide supports and anchors complying with Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors".

2.7 Valves: Provide valves complying with Division-15 Basic Mechanical Materials and Methods section "Valves" and in accordance with the following listing.

2.7.1 Gas Cocks 2" and Smaller: UL-listed, AGA approved, 150 psi non-shock WOG, full port, bronze straightway cock, flat or square head, threaded ends.

2.7.2 Gas Cocks 2½" and Larger: UL-listed, CGA approved, MSS SP-78; 175 psi, lubricated plug type, full port, semi-steel body, single gland, wrench operated, flanged ends.

2.7.3 Acceptable Manufacturers for gas cocks: Subject to compliance with requirements, provide products of one of the following: Resun R1430 and R1431, Milliken 200M and 201M or approved equal.

2.8 Kitchen Gas Appliance Connectors: Provide at all kitchen gas appliances connectors of annealed 304 stainless steel tubing with Type 304 stainless steel braiding to protect tubing from elongation, PVC coating surrounding steel braiding with suitable ends for appliance connection and quick connects. Provide NSF & (AGA or CGA) approvals. Where kitchen equipment gas appliance connectors serve movable appliance (on castors), provide swivel fittings and quick connects that close upon disconnection. Hose length for movable appliances shall be 1.25 times the depth of the appliance. Appliance restraining device shall prevent over extension of connecting tube.

2.9 Gas Appliance Tube Connectors: Provide commercial grade appliance connectors with a 2 year manufacturer's warranty. Tubing shall be Type 304 stainless steel tubing with type 304 stainless steel braiding and pvc plastic coating to protect tubing from elongation. Tubing shall be complete with factory installed end connectors. Provide products that are AGA or CGA approved. Indicate Maximum BTU input for each length and size used on submittal. Provide appliance restraining cables for appliances on wheels.

2.10 LP Gas Storage Container: Provide storage tanks of capacities shown on the drawings; constructed and installed in accordance with ASME standards for LP gas containers and NFPA 58. Tanks shall be mounted and marked in accordance with NFPA 58 and shall include all appurtenances (including safety relief device, multi-valve, check valve, float gauge, fill valve, pressure gauge, evacuation tube assembly and pressure regulator) required by NFPA 58 or listed herein. Acceptable Manufacturer: Subject to compliance with requirements, provide products of one of the following: American Welding and Tank Co., or approved equal.

2.11 Gas Regulators:

2.11.1 First Stage Regulators: Provide UL listed first stage (high pressure) regulators set for 15 psi.

2.11.2 Second Stage Regulators: Provide UL listed second stage (1-5 psi) adjustable regulators with integral relief valves.

2.11.3 Acceptable Manufacturers: Subject to compliance with requirements, provide regulators by Fisher, or approved equal.

2.12 Gas Meter and Regulator: Provided by contractor-selected LP supplier.

2.13 Access Doors: Provide access doors to service all valves and other devices as required in accordance with Division-15 Basic Materials and Methods Section "Access Doors".

3 EXECUTION

3.1 Examine areas and conditions under which gas systems materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer. Coordinate with gas supplier prior to starting work.

3.2 Install mechanical identification in accordance with Division-15 Basic Mechanical Materials and Methods section "Mechanical Identification".

3.3 Install gas piping in accordance with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".

3.3.1 Use sealants on metal gas piping threads which are chemically resistant to gas. Use sealants sparingly, and apply to only male threads of metal joints.

3.3.2 Remove cutting and threading burrs before assembling piping.

3.3.3 Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped or damaged. Do not use bushings in the gas system.

3.3.4 Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping, or equipment connections are completed.

3.3.5 Ground gas piping electrically and continuously within project, and bond tightly to grounding connection.

3.3.6 Install drip-legs in gas piping where indicated, and where required by code or gas company requirements.

3.3.7 Install "Tee" fitting with bottom outlet plugged or capped, at bottom of pipe risers.

3.3.8 Use dielectric unions where dissimilar metals are joined together.

3.3.9 Install piping with 1/64" per foot (⅛%) downward slope in direction of flow.

3.3.10 Install piping parallel to other piping, but maintain minimum of 12" clearance between gas piping and steam or hydronic piping above 200˚F.

3.3.11 For piping underground beneath buildings, install in welded conduit. Extend conduit inside and terminate in accessible portion of building and seal. Extend conduit outside minimum of 4" from building, and vent above grade.

3.4 Gas Service: Arrange with LP gas company to provide gas service to indicated location with meter, pressure regulator and shutoff at terminus. Consult with utility as to extent of its work, costs, fees, and permits involved. The Contractor shall pay such costs and fees and obtain permits.

3.5 Install piping specialties in accordance with Division-15 Basic Mechanical Materials and Methods section "Piping Specialties".

3.6 Install supports and anchors in accordance with Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors".

3.7 Installation of Valves:

3.7.1 Gas Cocks: Provide at connection to gas train for each gas-fired equipment item; and on risers and branches where indicated.

3.7.2 Locate gas cocks where easily accessible, and where they will be protected from

possible injury.

3.8 Equipment Connections: Connect gas piping to each gas-fired equipment item, with drip leg and shutoff gas cock. Comply with equipment manufacturer's instructions.

3.9 Appliance Connectors: Install tubing, valves, connectors, fittings in accordance with their listing. Hose, fittings and valves shall not restrict gas flow and shall be rated for the capacity of the appliance they serve. Hoses shall not be crimped. Hoses behind movable appliances shall not be crimped when appliance is extended from wall or when appliance is set in working position. Appliance restraining device shall set to engage just prior to the connector being fully extended. Check all tubing, piping, fittings & valves for leakage at less than 50 part per million.

3.10 Locate and coordinate installation of access doors for all valves and devices in accordance with Division-15 Basic Mechanical Materials and Methods section "Access Doors".

3.11 LP Gas Container Installation:

3.11.1 Install in accordance with NFPA 58. Locate containers where shown on the drawings, but not less than 10 feet from any building (500 gallons or less) or 25 feet from any building (501-2000 gallons).

3.11.2 Gas company will install container.

3.11.3 Coat underground containers with 2 coats of coal tar or bitumastic paint. The top of the tank shall be at least 2 feet below grade. Provide waterproof manhole and cover as required. Provide concrete ballast and hold down straps as detailed on the drawings.

3.11.4 Paint above ground tanks with two coats of white enamel paint suitable for the service indicated, or as furnished by the gas supplier. Provide tank saddles and supports as detailed on the drawings. Shim and level to ensure full bearing on supports.

3.11.5 Provide concrete-filled steel bollards (3" pipe size) as required to protect LP gas containers. Paint yellow.

3.12 Piping Tests: Inspect, test, and purge gas systems in accordance with NFPA 54, local utility requirements, and Division-15 Basic Mechanical Materials and Methods section "Testing, Cleaning and Sterilization of Piping Systems".

END OF SECTION

SECTION 15455/MEDICAL GAS SYSTEMS

1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Materials and Methods sections apply to work of this section.

1.3 This section refers to medical gases including:

Oxygen

1.4 Refer to Division-16 sections for the following work; not work of this section.

1.4.1 Power supply wiring from power source to power connection on air compressors and other devices. Include disconnects, and required electrical devices, except where specified as furnished, or factory installed, by manufacturer.

1.5 Provide the following as part of this section's work, complying with the requirements of Division 16.

1.5.1 Alarm and signal wiring.

1.6 Codes and Standards: Provide systems and components which are listed by Underwriters Laboratories and comply with NFPA-99. All components and materials used in systems for oxygen shall be oxygen compatible.

1.7 Approval Submittals:

1.7.1 Product Data: Submit manufacturer's technical product and performance data for the following:

1.7.1.1 Valves

1.7.1.2 Zone valve boxes

1.7.1.3 Gas service outlets

1.7.1.4 Manifold

1.7.1.5 Cylinders

1.7.1.6 Hoses

1.7.1.7 Alarm panels

1.7.1.8 Alarm system devices

The control section shall include a change-over actuating switch to signal the master medical gas alarm system when the manifold has changed from the exhausted primary supply to the secondary supply bank. The control section shall have a green SYSTEM NORMAL lamp to indicate the primary supply bank is functioning and a red REPLACE DEPLETED BANK lamp to indicate that change-over to the secondary supply has occurred.

The manifold system shall be provided with a power supply box (rated NEMA 3R) to convert 115 VAC to 24 VAC to supply the electrical power to the manifold. The power supply shall contain a circuit board to isolate the master medical gas alarm signal wiring from the manifold control cabinet wiring.

Manifold requires a single point of 120V/1ϕ power connection. Sensor wiring shall be placed in conduit in accordance with Division 16 requirements. This contractor shall include all control wiring between line sensors and alarm or manifold circuits in the bid and hire a competent licensed electrical contractor to provide all control wiring to complete installation. Division 16 shall provide 120V/1ϕ power to the master alarm and manifold system.

2.8 Cylinders: Cryogenic and gas cylinders shall meet all requirements of D.O.T. specifications and guidelines. Cylinders shall be identified by attached labels in accordance with CGA Pamphlet C-7. Cylinders will be provided by the Owner's authorized supplier. The supplier will be notified by the Owner to supply tanks. Contractor will assist and provide all materials and labor to set system into operation after supplier delivers the cylinders.

2.9 Hoses: Metallic and non-metallic hoses or flexible connections shall not be longer than required and shall not be concealed in wall ceilings or partitions. Hoses shall have a flame spread rating less than 200 and meet NFPA 255 criteria. Header manifold hoses shall be metal braided.

2.10 Alarm Panels: Provide modular alarm panels with audible and noncancellable visual alarms with pressure gauges. Provide a closed-circuit, self-monitoring alarm system with provisions for testing. Construct roughing-in box of extruded aluminum with plaster frame. Provide chrome-plated and painted cover. Power supply shall be 120 VAC. Provide master alarm panels as shown on the drawings. Alarms shall include:

Oxygen Line Pressure Low
Oxygen Line Pressure High
Oxygen Pressure Abnormal
Oxygen Reserve in Use
Oxygen Secondary Supply in Use
Oxygen Liquid Level Low
Reserve Oxygen Vessel Pressure Low
Oxygen Emergency Reserve Low
Vacuum Line - Vacuum Below Normal

2.11 Alarm System Devices

2.11.1 High-Low Pressure Switch (for oxygen): Provide dual circuit, SPDT, snap action switch cleaned per NFPA-99, pre-wired with six 18" lengths of color-coded wire. Rate switches for 10 amps at 120 VAC. Switches shall be tested for 180 psi. Switches shall be adjustable with external calibrated dials and tamper-proof cover. Provide NEMA-4 housing.

2.11.2 Pressure Gauges: Provide 1½" diameter gauges with 2/3" MNPT threaded, center back connector. Calibration shall be 0-100 psi.

2.11.3 Orifice Nipples: Provide brass orifice nipples for pressure switches with ¼" NPT male threads at each end.

3 EXECUTION

3.1 Install piping, pipe fittings, piping specialties, valves, gauges and supports and anchors complying with other Division-15 sections as modified herein.

3.2 Install piping that is in combustible partitions in conduit. Firestop all piping.

3.3 Protect riser piping in walls from punctures with metal sleeves.

3.4 Protect piping from contact of dissimilar metals, using plastic spacers or similar methods.

3.5 All joints in concealed piping shall be brazed. Flared or compression fittings are allowed only on tubing ½" and smaller that is visible in rooms. All threaded joints shall be tinned with soft solder. Tube bends 45° or less shall be made with bending tools. Tube bends over 45° shall be made with fittings.

3.6 Individually support piping as follows:

| | |
|---|---|
| Smaller than ½" | 6' on center horizontal |
| ¾" to 1" | 8' on center horizontal |
| 1¼" and larger | 10' on center horizontal |
| All piping at each floor vertical | |

3.7 Install service valves in main, at base of riser and where shown on the drawings. Label service valves and lock open.

3.8 Locate and coordinate installation of access doors for all valves and devices in accordance with Division-15 Basic Mechanical Materials and Methods section "Access Doors".

3.9 Clean all piping, fittings, and components free of oil, grease, and other oxidizable materials as if for oxygen service. Do not use carbon tetrachloride. Clean per CGA Pamphlet G-4.1 "Cleaning Equipment for Oxygen Service". Deliver all tubing to the jobsite cleaned and capped. Inspect prior to use. All components requiring cleaning at the jobsite shall be cleaned by washing in a hot alkaline cleaner-water solution, scrubbed, then rinsed in clean, hot water.

3.10 Purge with nitrogen during brazing.

3.11 Braze valve flange faces into line without valve body and allow to cool before installing valve body.

3.12 Wash the outside of all tubing, joints, and fittings with hot water.

3.13 Install tubing to station outlets as follows: oxygen - ½" O.D. (one outlet only).

3.14 Locate groups of pipes parallel to each other, spaced to permit servicing valves. All branches and outlets shall be taken from the top of the main.

3.15 Install all alarm panels, pressure switches, gauges, valves, zone valve boxes, outlets, and other devices per NFPA-99 and the manufacturer's instructions.

3.16 Check entire system for correctness of operation, installation, control sequencing, and alignment. Start all components in proper sequence. Make adjustments required to insure proper smooth quiet operation.

3.17 Performance Criteria and Testing

3.17.1 Perform cross-connection test per NFPA-99 to verify no cross-connections exist to any other system.

3.17.2 Visually inspect each brazed joint. Remove excess flux.

3.17.3 Verify labeling at station outlets, valves, and panels.

3.17.4 After piping is installed (but before installing station outlets, gauges, pressure switches, manifolds, and reliefs) blow the system clear with nitrogen or oil-free dry air.

3.17.5 Pressure test to 150 psi with nitrogen or oil-free dry air before closing walls. Test gas systems individually.

3.17.6 Install all components then test at 120% of normal operating pressure for 24 hours.

3.17.7 Purge the system with the proper gas progressively through all outlets at 100 l/min until a white cloth shows no discoloration.

3.17.8 Test each outlet with oxygen or other gas to confirm the desired percentage of oxygen or the proper gas.

3.17.9 Test changeover and reserve signals for all cylinders.

3.17.10 Test pressure relief valves.

3.17.11 Test air compressors and accessories.

3.17.12 Perform purity test for gas quality.

3.17.13 Test all alarms - master and area.

3.17.14 Set central gas supplies to maintain 50-55 psi.

3.18 Notify Architect/Engineer, Owner, and Contractor of all tests one week in advance so tests can be witnessed.

3.19 A qualified representative of the medical gas equipment supplier (with a minimum of five years experience) shall inspect the entire installation, perform startup services, witness all tests, check all outlets and alarms, and certify in writing that the system is installed correctly and meets the requirements of NFPA 99, 2002 Edition. Inspector shall provide proof of liability insurance to Owner and General Contractor at time of inspection, with a written document. Include document with inspection report. This Contractor shall notify the General Contractor of inspection time. Concealment shall not commence until inspection is completed. This arrangement may required two visits by inspector. Furnish three copies of the certification letter to the Architect/Engineer prior to substantial completion inspection.

END OF SECTION

# SECTION 15457/MEDICAL VACUUM SYSTEM

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Materials and Methods sections apply to work of this section.

1.3 This section refers to medical vacuum systems only.

1.4 Refer to Division-16 sections for the following work; not work of this section.

1.4.1 Power supply wiring from power source to power connection on vacuum producers and other devices. Include disconnects, and required electrical devices, except where specified as furnished, or factory installed, by manufacturer.

1.5 Provide the following as part of this section's work, complying with the requirements of Divison 16.

1.5.1 Alarm and signal wiring.

1.6 Codes and Standards: Provide systems and components which are listed by Underwriters Laboratories and comply with NFPA-99.

1.7 Approval Submittals:

1.7.1 Product Data: Submit manufacturer's specifications, drawings, installation and start-up instructions, and performance data for the following:

1.7.1.1 Vacuum producers

1.7.1.2 Valves

1.7.1.3 Zone valve boxes

1.7.1.4 Alarm panels - See Section 15455 / Medical Gas Systems.

1.7.1.5 Alarm system devices

1.7.1.6 Access doors

1.8 Test Reports and Verification Submittals:

1.8.1 Submit brazer's certificate.

1.8.2 Certifications: Submit certificate by medical vacuum equipment supplier that all cross-connection tests, pressure tests, cleaning, purging, purity tests, equipment tests, operational tests, outlet tests and alarm tests have been completed and are satisfactory.

1.9 O&M Data Submittals:

1.9.1 Wiring Diagrams: Submit manufacturer's electrical requirements for wiring to vacuum producers and alarm system. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Submit wiring diagrams for alarm panels. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

1.9.2 Maintenance Data: Submit a copy of approval submittals and maintenance data and parts lists for each vacuum producer, control, alarm panel, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, and wiring diagrams in O&M manual.

2 PRODUCTS

2.1 General: Provide equipment, piping materials, and factory-fabricated piping products of types, sizes, pressure ratings, temperature ratings, and capacities indicated. Where not indicated, provide proper selection as determined by Installer to comply with the installation requirements. Provide materials and products complying with NFPA-99. Provide sizes and types of pipe and equipment to match existing pipe and materials to the extent possible.

2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products manufactured by Medaes (OHMEDA), Chemetron (NCG), Puritan Bennet or approved equal. Pump may be supplied by Squire Cogswell.

2.3 Piping: Provide hard drawn, seamless, Type L copper tubing complying with ASTM B88. Provide brazed copper fittings or threaded fittings as indicated. Provide brazing materials per ANSI A5.8. Use brazing filler alloy or solder with a melting point of 450˚F or greater. Use long radius elbows.

2.4 Valves: Provide quarter turn, bolted union ball shutoff valves constructed of brass or bronze, solder type. Ball seats shall be constructed of Buna-N or Teflon and shall wipe the ball clean on each operation. Provide blowout-proof stem. Valves shall be cleaned for oxygen service and capped. Valve handles shall be labeled for vacuum service.

2.5 Zone Valve Boxes: Provide extruded aluminum recessed valve boxes with plaster frames, label holders and labels identifying vacuum, concealed mounting screws, and tinted, transparent, frangible window with pull ring. Valve boxes shall contain the quantity and type valves for vacuum and gases as shown on the drawings. Valve boxes shall house valves and 1-1/2" line vacuum gauges. Coordinate with Section 15455 / Medical Gas Systems.

2.6 Vacuum Service Outlets: Provide recessed vacuum service outlets manufactured per NFPA standards. Outlets shall be of modular design. Provide outlets that are factory tested leak free, cleaned and tested, with vacuum specific, non-interchangeable parts. Outlets shall be labeled. Provide brushed stainless steel finish plate and chrome-plated

cover plate. Provide wall outlets as required. Construct hoses of neoprene able to withstand 200 psi. Terminate hose bottom ends with appropriate hex nut and gland connection. Hose shall extend to 6'-4" above finished floor. Terminate hose with safety-keyed check unit or "Hand-I-Twist" check unit. Coordinate with medical gas service outlets.

2.7 Alarm Panels: Refer to Section 15455 / Medical Gas Systems for alarm panel. Alarm panel will require oxygen and vacuum modules.

2.8 Alarm System Devices

2.8.1 Vacuum Switch: Provide SPDT, snap action switch cleaned per NFPA-99 with electrical terminals. Rate switches for 5 amps at 240 VAC. Switches shall be tested at 30 in. Hg. vacuum. Switches shall be adjustable with external dials over a range of 30 in. Hg. to 10 psi. Provide NEMA-1 housing.

2.8.2 Vacuum Gauges: Provide 1-1/2" diameter gauges with 1/4" NPT threaded connector. Calibration shall be 0-30 in. Hg.

2.8.3 Orifice Nipples: Provide brass orifice nipples for vacuum switches with 1/4" NPT male threads at each end.

2.9 Medical Vacuum Producers: Provide factory-tested, continuous duty rated, base-mounted, packaged, duplex medical vacuum producer assembly that requires only air intake, air discharge, and one electrical connection. Basis of Design: Squire Cogswell or approved equal meeting NFPA-99 with the following features:

2.9.1 Motors: ODP. High efficiency per Division-15 section "Motors".

2.9.2 Starter: UL-listed, duplex system in NEMA-12 cabinet with circuit breakers, magnetic starters, overloads, HOA switches, hour meters, and timer/alternator to cycle vacuum producers at timed intervals.

2.9.3 Vacuum Pumps: Duplex rotary valve medical vacuum pump with receiver. Pump to be complete with dual electrical and alarm connections. Provide 24-month warranty.

2.9.4 Safety Devices: Provide thermal overload protection with alarm to master panel for each vacuum producer.

2.9.5 Package Piping: Type K or L copper tubing with brazed joints per NFPA-99. Provide vacuum pump isolation valves on suction and discharge. Provide in-line, canister type filter/silencer on suction. Provide check valve, pressure relief valve and isolation ball valve on each discharge manifold.

2.9.6 Maintenance: Provide service by the supplier available at any time with 24 hour guaranteed response time.

2.9.7 Cabinet: Provide removable sound attenuating cabinet that provides for system cooling. Maximum 75 dB(A).

2.9.8 Air Receiver: Provide ASME code stamped, National Board registered receiver with pressure relief valve, drain, pressure gauge, and automatic drain trap.

2.9.9 Provide discharge muffler.

2.9.10 Provide piping specialties, supports and anchors, complying with other Division-15 sections.

2.10 Vibration Isolation: Provide vibration isolation complying with Division-15 Basic Materials and Methods section "Vibration Isolation", and in accordance with the following listing:

2.10.1 Vacuum Pump Mounting: EM5.

2.10.2 Vacuum Pump Suction and Discharge Piping: PF5.

2.11 Access Doors: Provide access doors to service all valves and other devices as required in accordance with Division-15 Basic Materials and Methods Section "Access Doors".

3 EXECUTION

3.1 Install piping, pipe fittings, piping specialties, valves, gauges and supports and anchors complying with other Division-15 sections as modified herein.

3.2 Install underground piping in duct or casing. Install piping in combustible partitions in conduit. Firestop all piping.

3.3 All joints in concealed piping shall be soldered or brazed. Flared or compression fittings are allowed only on tubing 1/2" and smaller that is visible in rooms. All threaded joints shall be tinned with soft solder. Tube bends 45° or less shall be made with bending tools. Tube bends over 45° shall be made with fittings.

3.4 Individually support piping as follows:

| | |
|---|---|
| Smaller than 1/2" | 6' on center horizontal |
| 3/4" to 1" | 8' on center horizontal |
| 1-1/4" and larger | 10' on center horizontal |
| All piping | at each floor vertical |

3.5 Install service valves in main, at base of risers and where shown on the drawings. Label service valves and lock open.

3.6 Clean all piping, fittings, and components free of oil, grease, and other materials. Do not use carbon tetrachloride.

3.7 Label all vacuum piping prior to installation.

3.8 Wash the outside of all tubing, joints, and fittings with hot water.

3.9 Locate groups of pipes parallel to each other, spaced to permit servicing valves. All branches and outlets shall be taken from the top of the main.

3.10 Locate and coordinate installation of access doors for all valves and devices in accordance with Division-15 Basic Mechanical Materials and Methods section "Access Doors".

3.11 Install vacuum producer on reinforced concrete base. Set and level unit on vibration isolators. Install flexible connectors and all accessories. Install and start units in accordance with manufacturer's instructions. Pipe drains to nearest floor drain with copper tubing.

3.12 Provide startup service for vacuum producers.

3.13 Install all alarm panels, vacuum switches, gauges, valves, zone valve boxes, outlets, and other devices per NFPA-99 and the manufacturer's instructions.

3.14 Check entire system for correctness of operation, installation, control sequencing, and alignment. Start all components in proper sequence. Make adjustments required to insure proper smooth quiet operation.

3.15 Performance Criteria and Testing:

3.15.1 Perform cross-connection test per NFPA-99 to verify no cross-connections exist to any other system.

3.15.2 Verify labeling at station outlets, valves, and panels.

3.15.3 After piping is installed (but before installing station outlets, gauges, vacuum switches, and vacuum pumps) blow the system clear with nitrogen or oil-free dry air.

3.15.4 Pressure test to 150 psi with nitrogen or oil-free dry air before closing walls. Test vacuum system individually.

3.15.5 Install all components except vacuum pump, then test at 60 psi for 24 hours.

3.15.6 Test each terminal outlet for 3 cfm of flow at 12 in. Hg.

3.15.7 Perform vacuum drop test on each section of the system. Test fails if vacuum drops greater than 1.5 in. Hg./hr at 12 in. Hg.

3.15.8 Test vacuum producers and accessories.

3.15.9 Test all alarms - master and area.

3.15.10 Set vacuum producers to maintain 12 in. Hg. at the most remote terminal.

3.16 Notify Architect/Engineer, Owner, and Contractor of all tests one week in advance so

tests can be witnessed.

3.17 A qualified representative of the medical vacuum equipment supplier shall inspect the entire installation, perform startup services, witness all tests, check all outlets and alarms, and certify in writing that the system is installed correctly. Furnish three copies of the certification letter to the Architect/Engineer prior to final inspection.

3.18 A qualified representative of the medical gas equipment supplier (with a minimum of five years experience) shall inspect the entire installation, perform startup services, witness all tests, check all outlets and alarms, and certify in writing that the system is installed correctly and meets the requirements of NFPA 99, 2002 Edition. Inspector shall provide proof of liability insurance to Owner and General Contractor at time of inspection, with a written document. Include document with inspection report. This Contractor shall notify the General Contractor of inspection time. Concealment shall not commence until inspection is completed. This arrangement may required two visits by inspector. Furnish three copies of the certification letter to the Architect/Engineer prior to substantial completion inspection.

END OF SECTION

SECTION 15475/PLUMBING PUMPS

1.0 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Materials and Methods sections apply to work of this section.

1.3 Extent of plumbing pumps work required by this section is indicated on drawings, and by requirements of this section.

1.4 Types of pumps specified in this section include the following:

1. In-Line Recirculation Pumps.

1.5 Refer to other Division-15 sections for insulation of pump housings; not work of this section.

1.6 Refer to Division-16 sections for the following work; not work of this section.

1.6.1 Power supply wiring from power source to power connection on pumps. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory installed, by manufacturer.

1.6.2 Interlock wiring between pumps; and between pumps and field-installed control devices.

1.7 Codes and Standards: Provide electric motors and components which are listed and labeled by Underwriters Laboratories and comply with NEMA standards.

1.8 Submittals:

1.8.1 Product Data: Submit manufacturer's pump specifications, installation and start-up instructions, and current accurate pump characteristic performance curves with selection points clearly indicated.

1.8.2 Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.

1.8.3 Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to plumbing pumps. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

1.8.4 Maintenance Data: Submit maintenance data and parts lists for each type of pump, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division 1.

2.0 PRODUCTS

2.1 General: Provide factory-tested pumps, thoroughly cleaned, and painted with one coat of machinery enamel prior to shipment. Type, size, and capacity of each pump is listed herein. Provide pumps of same type by same manufacturer.

2.2 In-Line Recirculation Pumps:

2.2.1 General: Provide in-line all-bronze recirculation pumps where indicated, and of capacities as indicated.

2.2.2 Type: Horizontal, oil-lubricated, designed for 125 psi working pressure, 225°F continuous water temperature, and specifically designed for quiet operation.

2.2.3 Body: Bronze construction.

2.2.4 Shaft: Steel, ground and polished, integral thrust collar.

2.2.5 Bearings: Two horizontal sleeve bearings designed to circulate oil.

2.2.6 Seal: Mechanical, with carbon seal face rotating against ceramic seat.

2.2.7 Motor: Non-overloading at any point on pump curve, open, drip-proof, sleeve bearings, quiet operating, rubber mounted construction, built-in thermal overload protection.

2.2.8 Coupling: Self-aligning, flexible coupling.

2.2.9 Manufacturer: Subject to compliance with requirements, provide in-line recirculation pumps of one of the following:

1. Amtrol Inc.
2. Armstrong Pumps, Inc.
3. Bell & Gossett ITT.
4. Dunham-Bush, Inc.
5. Taco, Inc.

2.2.10 Basis of Design: Bell & Gossett Series PR, 3/4", 1/6 hp, 115 volts, 15 gpm at 14 feet head.

3.0 EXECUTION

3.1 Examine areas and conditions under which plumbing pumps are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 General: Install plumbing pumps where indicated, in accordance with manufacturer's published installation instructions, complying with recognized industry practices to ensure that plumbing pumps comply with requirements and serve intended purposes.

3.3 Access: Provide access space around plumbing pumps for service as indicated, but in no case less than that recommended by manufacturer.

3.4 Support: Install base-mounted pumps on minimum of 4" high concrete base equal or greater than 3 times total weight of pump and motor, with anchor bolts poured in place. Set and level pump, grout under pump base with non-shrink grout. Install inline pumps, supported from piping system.

3.5 Basins: Install sump pump basins in indicated locations and connect to sewer inlets. Brace interior of basin in accordance with manufacturer's instructions, to prevent distortion or collapse during concrete placement. Refer to Division 3 for concrete work; not work of this section. Set cover over basin, fasten to top flange of basin. Install so cover is flush with finished floor.

3.6 Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

3.7 Piping Connections: Refer to Division-15 plumbing piping sections. Provide piping, valves, accessories, gages, supports, and flexible connections as indicated. Install strainer on inlet and shut-off valves on inlet and outlet of recirculation pumps. Install check valve in rise from sump pumps.

3.8 Alignment: Check alignment, and where necessary, realign shafts of motors and pumps within recommended tolerances by manufacturer.

3.9 Start-Up: Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.

3.10 Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

# SECTION 15700/OUTSIDE AIR PRECONDITIONING UNITS

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Refer to other Division-15 sections for testing, adjusting, and balancing of air conditioning units (ACUs).

1.4 Approval Submittals:

1.4.1 Product Data: Submit manufacturer's technical product data, including dimensions, ratings, electrical characteristics, weight, capacities, materials of construction, and installation instructions.

1.4.1.1 Preconditioning units

1.4.1.2 Vibration isolation.

1.5 Test Reports and Verification Submittals:

1.5.1 Submit Startup Report by factory-trained representative.

1.6 O&M Data Submittals: Submit manufacturer's maintenance data including parts lists. Include these data, a copy of approval submittals, product data, and wiring diagrams in O&M manual.

## 2 PRODUCTS

2.1 Quality Assurance:

2.1.1 Provide units tested by UL, ARL or ETL.

2.1.2 Construct refrigeration system in accordance with ASHRAE 15 (ANSI B 9.1) "Safety Code for Mechanical Refrigeration".

2.1.3 Provide units with an EER that meets the Florida Energy Efficiency Code and the schedules on the drawings.

2.1.4 Acceptable Manufacturers: Subject to compliance with requirements provide units by Desert Air, Dectron, Addison or approved equal.

2.2 General:

2.2.1 Units shall be factory-assembled, wired and tested. All controls shall be factory-adjusted

and preset to the design conditions.

2.2.2 Casings: Construct of heavy gauge steel formed panels rigidly reinforced and braced. Each unit shall be provided with removable panels to permit the unit (including fans and compressors) to be properly maintained and serviced. Entire casing shall be painted with factory-applied finish. Casing for outdoor units shall be provided with weatherproof construction with all seams bolted. Units shall be sealed to minimize leakage.

2.3 Condensing Unit:

2.3.1 Condenser Fans and Drives: Fan shall of rustproof construction: hot-dipped galvanized steel, stainless steel or aluminum. Unit shall have a variable speed motor suitable for the duty indicated. Provide a close fretwork galvanized steel or non-ferrous fan and guard. Motors shall be the permanently lubricated type, resiliently mounted.

2.3.2 Condenser Coil: Construct of copper tubes and copper aluminum fins. Provide inlet guard to protect condenser fins.

2.3.3 Compressor: Shall be scroll design for R22 refrigerant with vibration isolation. Each compressor shall have separate refrigerant circuit. Motors shall be ball bearing, high starting torque, low starting current type for compressor service. Compressors shall not produce objectionable noise or vibration inside the building. Compressors shall have five (5) year warranty.

2.3.4 Service Valves: Provide for high and low pressure readings.

2.4 Evaporator Unit:

2.4.1 Interior of unit shall be thermally and acoustically insulated with minimum R=4.2 insulation. Provide aluminum inner liner. Provide removable panels to permit the unit to be properly serviced and maintained.

2.4.2 The evaporator shall include centrifugal fan, fan motor, vee belt drive, cast-iron sheaves, vari-pitch fan motor sheave, and lubricated bearings. Motors shall be high efficiency type as per Division-15, Basic Mechanical Materials and Methods section, "Motors". Provide cooling coils constructed of copper tubes and copper aluminum fins. System performance at design conditions must not change due to overloading with condensate. Filters and coils shall be selected for a maximum face velocity of 250 fpm. Provide expansion valve, sight glass, refrigerant drier, strainer, controls and other necessary devices for a completely automatic unit.

2.4.3 Air reheat coils and liquid subcooling coils shall have copper tubes and aluminum copperfins. Provide seacoast or heresite coating on the coils.

2.4.4 Each unit shall be equipped with sloped IAQ drain pans under the entire evaporator coil to prevent condensate carry-over. Drain pans shall be made of stainless steel or 12-gauge plastic.

2.4.5 Provide 2" metal mesh filters.

2.5 Electric Heater Section:

2.5.1 Provide electric heating coil controlled by one or more magnetic contactors. Three phase coils shall be wired for balanced current in each wire, if possible. Furnish and install necessary overheating and air flow controls to meet the requirements of the National Electric Code. Provide built-in air flow switch and heater interlock relay.

2.5.2 Heaters shall be factory-mounted and wired with all required fuses and contactors to provide single point connection.

2.6 Controls:

2.6.1 All safety and operational controls shall be factory wired and preset in a control panel in a separate compartment. Provide all necessary operational controls to heat, cool and dehumidify 100% outside air in accordance with the control diagrams on the drawings and the sequence of operation listed in Section 15905.

2.6.2 Safety and Operational Control Features:

1 Internal compressor overtemperature protection.
2 Hot gas reheat and thermostat to maintain supply air temperature.
3 Solid state adjustable trip overloads.
4 High pressure cutout.
5 Low pressure cutout.
6 Anti-recycle time delay start.
7 Phase failure and low voltage protection.
8 Hot gas bypass. Provide special hot gas bypass with oil separator in systems with refrigerant pipe equivalent lengths greater than 75 feet.
9 Outside air thermostat to control compressor.
10 Thermal expansion valve.
11 Connection for remote on-off control.

2.6 Refrigerant Piping: All refrigerant pipe to be sized by the AC unit manufacturer.

2.6.1 Copper tubing ¾" and smaller: Type ACR, soft annealed temper; cast copper-alloy fittings for flared copper tubes; flared joints.

2.6.2 Copper tubing ⅞" - 4⅛": Type ACR, hard-drawn temper tubing; wrought-copper, solder-joint fitting; brazed joints.

2.6.3 Silver solder material: Silver solder bearing at least 15% silver; Sil Fos.

2.7 Basic Vibration Isolation: Provide vibration isolation products complying with Division-15 section "Vibration Isolation" and the following list:

2.7.1 Equipment Mounting: Neoprene pads.

3 EXECUTION

3.1 Installation: Install in accordance with producer's printed instructions. Brush out fins on all coils.

3.2 Mount units on vibration isolation and concrete pads.

3.3 Refrigerant Piping: Comply with ANSI B31.5, "Refrigerant Piping," (except lower pressure limits below 15 psig), and ASHRAE 15 (ANSI B9.1). Make all joints carefully and neatly. Clean pipe and fittings before fluxing. Remove burrs. Braze by the sweat method using Sil Fos. Install field installed refrigerant devices and valves as required.

3.4 Testing: After job erection, or modification of factory installed piping, pressure test for leaks at 150 psig using a nominal amount of a suitable tracer refrigerant and dry nitrogen or a suitable refrigerant. Perform leak tests with an electronic halide leak detector having a sensitivity of at least ½ ounce R-12 per year. Refrigeration piping will not be accepted unless it is gas tight.

3.5 Evacuation: After completing the successful pressure test, multiple-evacuate the system. Leave the compressor isolation valves shut and connect the vacuum pump to both the high and loq sides. Evacuate the system to an absolute pressure of 1,500 microns. Then break vacuum to 2 psig with dry nitrogen. Repeat this process. Install the proper biflow drier in the liquid line and evacuate the system to 500 microns. Leave vacuum pump running for at least two hours without interruption. Break vacuum with the refrigerant to be used and raise pressure to 2 psig. Do not operate compressors during the evacuation procedure.

3.6 Charging: After completing the successful evacuation procedure, charge refrigerant directly to the system from the original containers through a filter drier. Charge to the manufacturer's stated conditions of pressure for required temperature. Weigh the refrigerant added and record on the startup report.

3.7 Controls: Set up controls for units as described in Section 15905.

3.8 Cleaning: Clean tar and all other soil from housing exterior. Leave ready for Division 7, Caulking Work. Caulk around pipe sleeves.

3.9 Construction Filters: Provide 1" thick filters in all units during construction. After construction (but prior to the test and balance being performed) install clean final filters.

3.10 Condensate Drain: Pipe trapped copper condensate drain (full size of unit outlet) as shown on the drawings. Refer to Division-15 section "Insulation" for pipe insulation.

3.11 Startup: Startup by a factory-trained representative. Check entire assembly for correctness of installation, alignment, and control sequencing. Start all component parts in proper sequence. Make all adjustments required to insure proper control and smooth quiet operation. Submit Startup Report.

END OF SECTION

# SECTION 15710/SPLIT SYSTEM AIR CONDITIONING UNITS

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Refer to other Division-15 sections for testing, adjusting, and balancing of air conditioning units (ACUs).

1.4 Approval Submittals:

1.4.1 Product Data: Submit manufacturer's technical product data, including dimensions, ratings, electrical characteristics, weight, capacities, materials of construction, and installation instructions.

1.4.1.1 Split system units

1.4.1.2 Vibration Isolation

1.5 O&M Data Submittals: Submit manufacturer's maintenance data including parts lists. Include these data, a copy of approval submittals, product data, and wiring diagrams in O&M manual.

## 2 PRODUCTS

2.1 Quality Assurance:

2.1.1 Provide units tested by UL, ARL or ETL.

2.1.2 Construct refrigeration system in accordance with ASHRAE 15 (ANSI B 9.1) "Safety Code for Mechanical Refrigeration".

2.1.3 Test and rate ACUs in accordance with the applicable ARI standards and provide certified rating seal. Sound test and rate units in accordance with ARI 270.

2.1.4 Provide units with an EER that meets the Florida Energy Efficiency Code and the schedules on the drawings.

2.1.5 Acceptable Manufacturers: Subject to compliance with requirements provide heat pump units by: Trane, Lennox, Addison or approved equal.

2.2 General:

2.2.1 Units shall be factory-assembled, wired and tested heat pumps. All controls shall be factory-adjusted and preset to the design conditions.

2.2.2 Casings: Construct of heavy gauge steel (or aluminum) formed panels rigidly reinforced

and braced. Each unit shall be provided with removable panels to permit the unit (including fans and compressors) to be properly maintained and serviced. Entire casing shall be painted with factory-applied finish. Casing for outdoor units shall be provided with weatherproof construction with all seams bolted.

2.2.3 Supports: Provide concrete pad 4" larger than the unit on all sides.

2.3 Condensing Unit:

2.3.1 Condenser Fans and Drives: Fan shall of rustproof construction: hot-dipped galvanized steel, stainless steel or aluminum. Unit shall have a variable speed motor suitable for the duty indicated. Provide a close fretwork galvanized steel or non-ferrous fan and guard. Motors shall be the permanently lubricated type, resiliently mounted.

2.3.2 Condenser Coil: Construct of copper nonferrous tubes and aluminum fins. Provide inlet guard to protect condenser fins.

2.3.3 Compressor: Shall be scroll, hermetic or semi-hermetic reciprocating design for R22 refrigerant with vibration isolation. Each compressor shall have separate refrigerant circuit. Motors shall be ball bearing, high starting torque, low starting current type for compressor service. Compressors shall not produce objectionable noise or vibration inside the building. Compressors shall have five (5) year warranty.

2.3.4 Service Valves: Provide for high and low pressure readings.

2.4 Evaporator Unit:

2.4.1 Interior of unit shall be thermally and acoustically insulated with minimum R=4.2 insulation. Provide removable panels to permit the unit to be properly serviced and maintained.

2.4.2 The evaporator shall include centrifugal fan, fan motor, direct drive, or cast-iron sheaves, vari-pitch fan motor sheave, and lubricated bearings. Motors shall be high efficiency type as per Division-15, Basic Mechanical Materials and Methods section, "Motors". Provide cooling coils constructed of copper tubes and aluminum fins. Filters and coils shall be selected for a maximum face velocity of 500 fpm. Provide thermal expansion valve, sight glass, refrigerant drier, strainer, controls and other necessary devices for a completely automatic unit.

2.4.3 Each unit shall be equipped with sloped IAQ drain pans under the entire evaporator coil to prevent condensate carry-over.

2.5 Electric Heater Section:

2.5.1 Provide electric heating coils controlled by one or more magnetic contactors. Three phase coils shall be wired for balanced current in each wire, if possible. Furnish and install necessary overheating and air flow controls to meet the requirements of the National Electric Code. Provide built-in air flow switch and heater interlock relay.

2.5.2 Heaters shall be factory mounted and wired with all required fuses and contactors to provide single point connection.

2.6 Unit Controls:

2.6.1 All safety and operational controls shall be factory wired.

2.6.2 Safety and Operational Control Features:

Internal compressor overtemperature protection.
Crankcase heaters.
Individual motor overcurrent protection.
High pressure cutout.
Low pressure cutout.
Anti-recycle timer (5 minute)
Timer-type defrost control for heat pumps.
Phase failure and low voltage protection for 3-phase units.
Liquid line solenoid.

2.6.3 Room thermostat shall be low voltage, programmable, remote-mounted with sub-base and thermometer for controlling heating and cooling cycles. See 15905 for further thermostat description and sequence of operation. Provide automatic changeover thermostats with fan that run continuously. The room thermostats shall be manually adjustable by occupants and shall indicate setting and temperature in degrees Fahrenheit. Provide two heating stages.

2.6.4 Electric heat shall energize during the defrost cycle.

2.6.5 Emergency heat switch shall allow operation of all electric heat.

2.6.6 Smoke Detector Operation: Duct-mounted smoke detectors are provided by Division-16 in the supply air stream that stop the ACU and heater when actuated where indicated on the drawings.

2.7 Refrigerant Piping:

2.7.1 Copper tubing ¾" and smaller: Type ACR, soft annealed temper; cast copper-alloy fittings for flared copper tubes; flared joints.

2.7.2 Copper tubing ⅞" - 4⅛": Type ACR, hard-drawn temper tubing; wrought-copper, solder-joint fitting; brazed joints.

2.7.3 Silver solder material: Silver solder bearing at least 15% silver; Sil Fos.

2.8 Basic Vibration Isolation: Provide vibration isolation products complying with Division-15 section "Vibration Isolation" and the following list:

2.8.1 Equipment Mounting: Neoprene pads.

3 EXECUTION

3.1 Installation: Install in accordance with producer's printed instructions. Brush out fins on all coils.

3.2 Support: Secure outdoor unit to withstand 125 mph wind velocity. Mount units on concrete pads with manufacturer's recommended service and operating clearance.

3.3 Mount units on vibration isolation and concrete pads or metal stands where required for bottom return air inlet.

3.4 Brush out fins on all coils.

3.5 Refrigerant Piping: Comply with ANSI B31.5, "Refrigerant Piping," (except lower pressure limits below 15 psig), and ASHRAE 15 (ANSI B9.1). Make all joints carefully and neatly. Clean pipe and fittings before fluxing. Remove burrs. Braze by the sweat method using Sil Fos. Install field installed refrigerant devices and valves as required.

3.6 Testing: After job erection, or modification of factory installed piping, pressure test for leaks at 150 psig using a nominal amount of a suitable tracer refrigerant and dry nitrogen or a suitable refrigerant. Perform leak tests with an electronic halide leak detector having a sensitivity of at least ½ ounce R-12 per year. Refrigeration piping will not be accepted unless it is gas tight.

3.7 Evacuation: After completing the successful pressure test, multiple-evacuate the system. Leave the compressor isolation valves shut and connect the vacuum pump to both the high and loq sides. Evacuate the system to an absolute pressure of 1,500 microns. Then break vacuum to 2 psig with dry nitrogen. Repeat this process. Install the proper biflow drier in the liquid line and evacuate the system to 500 microns. Leave vacuum pump running for at least two hours without interruption. Break vacuum with the refrigerant to be used and raise pressure to 2 psig. Do not operate compressors during the evacuation procedure.

3.8 Charging: After completing the successful evacuation procedure, charge refrigerant directly to the system from the original containers through a filter drier. Charge to the manufacturer's stated conditions of pressure for required temperature. Weigh the refrigerant added and record on the startup report.

3.9 Construction Filters: Provide 1" thick filters in all units during construction. After construction (but prior to the test and balance being performed) install clean final filters.

3.10 Cleaning: Clean tar and all other soil from housing exterior. Leave ready for Division 7, Caulking Work. Caulk around pipe sleeves.

3.11 Condensate Drain: Pipe trapped copper condensate drain (full size of unit outlet) to nearest floor or as shown on the drawings. Refer to Division-15 section "Insulation" for pipe insulation.

3.12 Startup: Check entire assembly for correctness of installation, alignment, and control sequencing. Start all component parts in proper sequence. Make all adjustments required to insure proper smooth quiet operation.

END OF SECTION

# SECTION SPLIT SYSTEM AIR CONDITIONING UNITS

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Refer to other Division-15 sections for testing, adjusting, and balancing of units; not work of this section.

1.4 Approval Submittals:

1.4.1 Product Data: Submit manufacturer's technical product data, including dimensions, ratings, electrical characteristics, weight, capacities, materials of construction, and installation instructions. Submit assembly-type drawings showing all piping and electrical connections and all mounting requirements. Show methods of fastening and assembly of components. Provide wiring diagrams.

1.5 O&M Data Submittals: Submit manufacturer's maintenance data including parts lists. Include these data, product data, and a copy of approval submittals in O&M manual.

## 2 PRODUCTS

2.1 Quality Assurance:

2.1.1 Test and rate split system air conditioning units in accordance with ARI Standard 210, 240 or 360 as applicable, and provide certified rating seal.

2.1.2 Construct refrigeration system of split system air conditioning units in accordance with ASHRAE 15 (ANSI B 9.1) "Safety Code for Mechanical Refrigeration".

2.1.3 Provide split system air conditioning units with an SEER that meets the Florida Energy Efficiency Code and the schedule on the drawings.

2.1.4 Provide split system air conditioning units that are designed, manufactured, and tested in accordance with UL or ETL requirements.

2.1.5 Acceptable Manufacturers: Submit to compliance with requirements, provide units by Sanyo, Toshiba, Mitsubishi, or approved equal.

2.2 General:

2.2.1 Casings: Construct of painted mill galvanized steel (or aluminum) formed panels rigidly reinforced and braced. Each unit shall be provided with removable panels to permit the unit (including fans and compressors) to be properly maintained and serviced.

2.3 Condensing Unit:

2.3.1 Condenser Fans and Drives: Fan shall be of rustproof construction, hot dipped galvanized steel, stainless steel or aluminum. Unit shall have weather protected totally enclosed motor. Provide a close fretwork galvanized steel or non-ferrous fan guard. Motors shall be the permanently lubricated type, resiliently mounted.

2.3.2 Condenser Coil: Construct of non-ferrous tubes and aluminum fins. Provide inlet guard to protect condenser fins.

2.3.3 Compressor: Shall be scroll or hermetic design with vibration isolation. Compressor shall not produce objectionable noise or vibration inside the building. Compressors shall have five (5) year warranty.

2.3.4 Service Valves: Provide for high and low pressure readings.

2.4 Evaporator Unit:

2.4.1 Interior of unit shall be thermally and acoustically insulated with 1 inch fiberglass duct liner insulation. Provide removable panels to permit the unit to be properly serviced and maintained.

2.4.2 The evaporator section shall include centrifugal fan, two-speed fan motor, and direct drive. Provide cooling coil, snap out washable filters, refrigerant drier, controls and other necessary devices for a completely automatic unit. Coils shall have copper tubes and aluminum fins. Provide automatic oscillating louver action to facilitate air distribution.

2.5 Controls:

2.5.1 All safety and operational controls shall be factory wired.

2.5.2 Provide remote microprocessor-based controls with room thermostat, timer and fan speed switch.

2.6 Refrigerant Piping:

2.6.1 Copper tubing 3/4" and smaller: Type ACR, soft annealed temper; cast copper-alloy fittings for flared copper tubes; flared joints.

2.6.2 Brazing material: Silver solder bearing at least 15% silver; Sil Fos.

2.7 Supports: Provide hurricane tie-down kits for outside units.

3 EXECUTION

3.1 Installation: Install in acordance with producer's printed instructions.

3.2 Support: Secure outdoor unit to withstand 125 mph wind velocity. Mount units on concrete pads with manufacturer's recommended service and operating clearance.

3.3 Refrigerant Piping: Comply with ANSI B31.5, "Refrigerant Piping," (extend lower

pressure limits below 15 psig), and ASHRAE 15 (ANSI B9.1). Make all joints carefully and neatly. Clean pipe and fittings before fluxing. Remove burrs. Braze by the sweat method using Sil Fos.

3.4 Testing: After job erection, pressure test for leaks at 150 psig using a nominal amount of a suitable tracer refrigerant and dry nitrogen or a suitable refrigerant. Perform leak tests with an electronic halide leak detector having a sensitivity of at least 1/2 ounce R-12 per year. Refrigeration piping will not be accepted unless it is gas tight.

3.5 Evacuation: After completing the successful pressure test, multiple-evacuate the system. Leave the compressor isolation valves shut and connect the vacuum pump to both the high and low sides. Evacuate the system to an absolute pressure of 1,500 microns. Then break vacuum to 2 psig with dry nitrogen. Repeat this process. Install the proper biflow drier in the liquid line and evacuate the system to 500 microns. Leave vacuum pump running for at least two hours without interruption. Break vacuum with the refrigerant to be used and raise pressure to 2 psig. Do not operate compressors during the evacuation procedure.

3.6 Charging: After completing the successful evacuation procedure, charge refrigerant directly to the system from the original containers through a filter drier. Charge to the manufacturer's stated conditions of pressure for required temperature. Weigh the refrigerant added and record on the startup report.

3.7 Insulation: Insulate refrigerant suction pipes with flexible unicellular with aluminum jacket.

3.8 Cleaning: Clean tar and all other soil from housing exterior. Leave ready for Division 7, Caulking Work. Caulk around pipe sleeves.

3.9 Condensate Drain: Pipe trapped copper condensate drain to outside the building or to a point of disposal as shown on the drawings. Pipe shall be full size of unit outlet. Refer to Division-15 section "Insulation" for pipe insulation.

3.10 Startup: Check entire assembly for correctness of installation, alignment, and control sequencing. Start all component parts in proper sequence. Make all adjustments required to insure proper smooth quiet operation.

END OF SECTION

# SECTION 15720/PACKAGED TERMINAL AIR CONDITIONERS

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions, and Division-1 Specification section apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of packaged terminal air conditioner work required by this section is indicated on drawings and schedules, and by requirements of this section. This section includes straight cool air conditioning units and heat pumps as scheduled on the drawings.

1.4 Refer to Division-16 sections for electrical work, including outlets; not work of this section.

1.5 Approval Submittals:

1.5.1 Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights, required clearances, dimensions, furnished specialties and accessories; and installation and start-up instructions. Submit manufacturer's electrical requirements for power supply wiring and outlets.

1.6 O&M Data Submittals: Submit maintenance data and parts list for each packaged air conditioning unit, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, and a copy of approval submittals in O&M manual.

## 2 PRODUCTS

2.1 Quality Assurance:

2.1.1 Construct refrigerating system of packaged units in accordance with ASHRAE Standard 15 "Safety Code for Mechanical Refrigeration".

2.1.2 Provide packaged units which are designed, manufactured, tested, and listed in accordance with UL requirements.

2.1.3 Provide packaged terminal air conditioning units with an SEER that meets the Florida Energy Efficiency Code and the schedule on the drawings.

2.1.4 Acceptable Manufacturers: Subject to compliance with requirements, provide packaged units of GE Zoneline, McQuay, Trane, Comfort Aire, or approved equal.

2.2 General: Provide air-cooled, factory-assembled and tested, thru-the-wall, packaged air conditioning units as indicated. Provide capacities and electrical characteristics as scheduled.

2.3 Cabinet: Provide painted metal cabinet with fiberglass lining for sound attenuation.

Provide wall sleeve, outside extruded aluminum louver (prefinished white) and trim pieces as required. Provide access panels as required for proper servicing of equipment. Provide steel linear supply air grilles. Provide galvanized steel insulated wall case.

2.4 Refrigeration System: Provide complete refrigerant circuit and hermetic rotary compressor with vibration isolation.

2.5 Controls: Provide two-stage thermostat, heat-cool switch, high-low fan switch, and air vent control.

2.6 Filters: Provide cleanable return air filters that can be removed without removing any panels.

2.7 Electric Heater: Provide unit mounted auxiliary electric heater controlled by second stage of thermostat.

2.8 Condensate Removal: Provide condensate drain and drain kit as required to remove condensate.

2.9 Accessories:

2.9.1 Provide sub-base with electrical separable connector or attachment plug and receptacle complying with National Electric Code 440-13 and 440-63 for all units.

2.9.2 Provide extruded aluminum grille with prefinished white color.

3 EXECUTION

3.1 General: Install thru-the-wall packaged air conditioning units in accordance with the manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

3.2 Support: Install wall sleeve. Coordinate with general construction work to ensure a water-tight seal.

3.3 Condensate Drain: Pipe trapped copper condensate drain to drain piping system or other point of disposal as shown on the drawings. Pipe shall be full size of unit outlet. Refer to Division-15 section "Insulation" for pipe insulation.

3.4 Accessories: Install ductwork kit and sub-base as indicated, in accordance with the manufacturer's instructions.

3.5 Startup units in accordance with manufacturer's instructions, test controls and check entire assembly for alignment. Make all adjustments required to insure proper, smooth, quiet operation.

END OF SECTION

SECTION 15810/FANS

1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of fan work required by this section as indicated on drawings and schedules, and by requirements of this section.

1.4 Coordination:

1.4.1 Refer to Division-7 sections for installation of prefabricated roof curbs; not work of this section. Furnishing prefabricated roof curbs is part of this section's work.

1.4.2 Refer to Division-15 section "Testing, Adjusting, and Balancing" for balancing of fans.

1.4.3 Refer to Division-15 HVAC control systems sections for control work required in conjunction with fans.

1.4.4 Refer to Division-16 sections for power supply wiring from power source to power connection on fans. Division-16 work will include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

1.5 Codes and Standards:

1.5.1 AMCA Compliance: Provide fans which have been tested and rated in accordance with AMCA standards, and bear AMCA Certified Ratings Seal.

1.5.2 UL Compliance: Provide fans which are listed by UL and have UL label affixed.

1.6 Approval Submittals:

1.6.1 Product Data: Submit manufacturer's technical data for fans, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions. Submit assembly-type drawings showing unit dimensions, construction details, methods of assembly of components, and field connection details.

1.6.1.1 Fans

1.7 O&M Data Submittals: Submit maintenance data and parts list for each type of fan, accessory, and control. Include these data, a copy of approved submittals, and wiring diagrams in O&M Manual.

2 PRODUCTS

2.1 General: Except as otherwise indicated, provide standard prefabricated fans of type and

size indicated, modified as necessary to comply with requirements, and as required for complete installation. Provide accessories as listed in the schedule on the drawings and as described herein. Motors shall be high efficiency per Division-15 section "Motors".

2.2 Acceptable Manufacturers: Subject to compliance with requirements provide fans manufactured by Acme, Greenheck, Loren Cook, Penn or approved equal unless otherwise noted herein.

2.3 Centrifugal Roof Exhausters:

2.3.1 Housing: Provide heavy gauge aluminum hood, housing, and base with a galvanized steel frame.

2.3.2 Fan Wheels: Provide aluminum air foil type, statically and dynamically balanced.

2.3.3 Drive: Provide direct or belt drive as scheduled with pre-lubricated, ball bearing, continuous duty type motors. Provide vibration isolation equipment for the entire drive.

2.3.4 Round Hood Fans: Where indicated provide fans with motors mounted in a separate compartment out of the air stream.

2.4 Centrifugal Ceiling Exhausters:

2.4.1 Fan Assembly: Provide steel housing, plastic or aluminum grille, backdraft damper, statically and dynamically balanced fan wheel, permanently lubricated motor with internal thermal overloads, vibration isolation and all required mounting hardware and brackets. Provide acoustically treated housing for all fans larger than 60 cfm. Mounting type shall be as indicated on the drawings or on the schedule.

2.4.2 Connectors: Provide adaptors, connectors, and eave elbows as required to connect fan discharges to outlets.

2.4.3 Outlets: Provide where shown on the drawings (or required by the installation) wall caps, vent caps, or roof jacks, each with birdscreen, to match fans and surrounding construction.

2.5 Fan Accessories and Features: Where indicated on the schedule or drawings provide accessories and features listed herein.

1 Belt drive: Belt drives shall include cast iron, variable pitch sheaves, heavy duty belts, and 1750 rpm motors. The drive shall be adjustable to plus or minus 10% of scheduled flow.

2 Direct drive: Direct drives shall have multispeed motors or speed controllers to achieve scheduled flow.

3 Curbs: Furnish 12 inch high, roofed over type, prefabricated aluminum curbs with treated wood nailer and 1-1/2" fire resistant fiberglass insulation sized to match the fans. For deck slopes of 1/4" per foot and more, fabricate curbs to form level top edge.

4 Bird Screens: Provide bird screens of 1/2" mesh aluminum or galvanized steel hardware cloth.

5 Backdraft Dampers: Provide where indicated aluminum louvered dampers with felt-edged blades and nylon bearings.

6 Disconnect Switches: Provide factory installed local disconnecting means for all 120 volt fans.

7 Thermal Overloads: Provide internal thermal overloads.

8 Inlet Grille: Provide where indicated aluminum ring type inlet grille for centrifugal wall exhausters.

9 Grilles: Provide where indicated optional steel inlet grilles finished with baked white enamel for ceiling fans.

10 Speed Controller: Provide where indicated solid state speed controller for remote mounting.

11 Motorized Dampers: Provide where indicated aluminum louvered dampers with felt-edged blades and nylon bearings with 120 volt motors wired to operate with the fan. Provide limit switch to prevent fan starting until damper is at least half open.

12 Interlocks: Fan shall be interlocked as described in Division-15 controls sections.

3 EXECUTION

3.1 General: Except as otherwise indicated or specified, install fans in accordance with manufacturer's installation instructions and recognized industry practices to insure that fans serve their intended function.

3.2 Coordinate fan work with work of roofing, walls, and ceilings as necessary for proper interfacing. Framing of openings, caulking, and curb installation is not work of this section.

3.3 Ductwork: Refer to Division-15 section "Ductwork". Connect ducts to fans in accordance with manufacturer's installation instructions. Provide flexible connections in ductwork at fans.

3.4 Install fans on vibration isolation equipment as required. Set level and plumb.

3.5 Roof Curbs: Furnish roof curbs to roofing Installer for Installation.

3.6 Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical Installer. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Verify proper rotation direction of fan wheels. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

3.7 Remove shipping bolts and temporary supports within fans. Adjust dampers for free

operation.

3.8 Testing: After installation of fans has been completed, test each fan to demonstrate proper operation of units at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

3.9 Cleaning: Clean factory-finished surfaces. Remove all tar and soil. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

# SECTION 15820/COOKING HOOD PACKAGED SYSTEM

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of cooking hood work required by this section is indicated on drawings and schedules, and by requirements of this section.

1.4 Coordination:

1.4.1 Refer to Division-7 sections for installation of prefabricated roof curbs; not work of this section.

1.4.2 Refer to Division-15 section "Testing, Adjusting, and Balancing" for balancing of fans.

1.4.3 Refer to Division-16 sections for power supply wiring from power source to power connection on hoods and fans. Division-16 work will include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer. Division-16 work includes all fire alarm tie-in work.

1.5 Codes and Standards:

1.5.1 Comply with NFPA 96 "Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment" requirements.

1.5.2 Comply with NFPA 70, National Electric Code.

1.5.3 UL Compliance: Provide hoods, fans, and fire extinguishing systems which are listed by UL and have UL label affixed.

1.5.4 NSF Approval: Provide hoods with NSF Seal of Approval.

1.5.5 Comply with NFPA 17 "Standard for Dry Chemical Extinguishing Systems" or NFPA 17A "Standard on Wet Chemical Extinguishing Systems" requirements and NFPA 300 for extinguishing equipment.

1.5.6 AMCA Compliance: Provide fans which have been tested and rated in accordance with AMCA standards, and bear AMCA Certified Ratings Seal.

1.6 Approval Submittals:

1.6.1 Project Data: Submit manufacturer's technical and product data, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions. Show size, length, and arrangement of all piping and a description and

location of all nozzles. Submit assembly-type shop drawings for fans and hoods showing unit dimensions, construction details, methods of assembly of components, and field connection details.

1.6.1.1 Hoods

1.6.1.2 Fans

1.6.1.3 Fire suppression equipment

1.7 O&M Data Submittals:

1.7.1 Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to hood, fans, and extinguishing systems. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

1.7.2 Maintenance Data: Submit maintenance data and parts list for fans and extinguishing system, each accessory, and control. Include this data, product data, drawings, wiring diagrams and a copy of approval submittals in O&M Manual.

2 PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide equipment by one of the following: Greenheck, Loren Cook, Greasemaster, Captive Aire, Duo Aire, or approved equal unless otherwise noted herein.

2.2 Cooking Hoods: Furnished and installed by the Contractor.

2.2.1 General: Except as otherwise indicated, provide packaged factory-built cooking hoods of type and size indicated, modified as necessary to comply with requirements, and as required for complete installation.

2.2.2 Sheetmetal: Fabricate hoods of 18-gauge sheet steel. Sheet metal shall be Type 304 stainless steel with No. 4 finish. All seams and joints shall have a liquidtight continuous external weld. All welds on stainless steel shall be ground and polished.Provide matching closure panel from top of hood to ceiling].

2.2.3 Grease Filters: Provide grease filters and frames constructed of stainless steel. Grease filters shall be 2" thick with stainless steel media, frame and reinforcing, and shall be listed for use with commercial cooking equipment. Filters shall be mounted at least 18" from any heat source and be protected by baffles if required. Filters shall be mounted a minimum of 4' vertical distance from charcoal or charcoal-type broilers. Filters shall be tight fitting and firmly held in place, but shall be easily accessible and removable for cleaning. Mount filters at 45° angle from horizontal.

2.2.4 Grease Filter Racks: Provide 20-gauge stainless steel construction with drip trays, braces, fasteners, container and all necessary fittings.

2.2.5 Controls: Provide hood control panel with switches and pilot lights for supply and exhaust fans, and light switch, all pre-wired with flush stainless steel faceplate on the front of the hood.

2.2.6 Supply Plenum: Where indicated, provide supply plenum lined with 1" thick foil backed rigid fiberglass insulation. Provide balancing dampers with locking quadrant to set supply air flow. Provide supply air registers of the type and size indicated. Provide fire dampers where supply plenum penetrates exhaust hood.

2.2.7 Fire Dampers: Refer to Division-15 section "Ductwork Accessories".

2.2.8 Lighting: Provide UL listed 100W incandescent vapor proof light fixtures with nickel plated sockets and heat resistant globes.

2.3 Piping: Schedule 40 steel with steel, malleable, or ductile iron threaded fittings. All visible piping and fittings shall be chrome plated or stainless steel. No galvanized pipe or fittings shall be used.

2.4 Fire Extinguisher System: (By Owner under separate contract, installed by Mechanical Contractor.)

2.4.1 General: Provide a UL-listed, pre-engineered, cartridge type, liquid agent or dry chemical fire suppression system designed for use with commercial cooking equipment. The system shall be from a single manufacturer and shall be complete and fully operational. Provide wall mounted tank cabinet. Basis of design: Ansul R102. Hook up and testing shall be done by a factory authorized Ansul representative.

2.4.2 Actuation: The system shall provide automatic detection and actuation with local or remote manual actuation. Actuation shall be accomplished by a cylinder release mechanism controlled by: automatic fusible link, remote manual by mechanical pull station, or local manual by push button at the hood. The system shall be capable of being tested without actual chemical discharge.

2.4.3 Nozzles: Nozzles shall be tested and listed for the specific applications. The number of nozzles, nozzle placement, and nozzle orifice size shall be determined by the Installer for the specific application. The system shall protect the hood, exhaust ducts, plenums, filters, and all cooking equipment under the hood.

2.4.4 Accessories:

2.4.4.1 Remote Manual Pull Station: Provide break glass type, stainless steel cable actuated pull station.

2.4.4.2 Gas Line Shutoff Valve: A UL-listed, mechanical gas valve shall be provided to automatically shut off all gas to equipment under the hood on actuation of the system.

2.4.4.3 Electric Power Shutoff: A UL-listed, pneumatically operated switch shall be provided to shut off electrical power to all appliances under the hood on actuation of the system.

2.4.4.4 Fire Alarm Initiation: Provide a UL-listed pneumatic-electric switch to send a signal to the fire alarm system on actuation of the system. Provide a local audible and visual alarm that shows the system has actuated.

2.4.4.5 Fan Shut Down: Provide a UL-listed, semi-automatic hand reset pneumatic-electric switch to stop hood supply fan on system actuation. Exhaust fan shall only stop if required by listing of other system component.

2.5 Exhaust Fan and Supply Fan Packages: By Mechanical Contractor.

2.5.1 General: Except as otherwise indicated, provide packaged, factory-built, roof-mounted, fan package assemblies of type and size indicated, modified as necessary to comply with requirements, and as required for complete installation. The entire unit shall be accessible from the roof through hinged access doors for steam cleaning all ducts and fans from the roof. The unit shall include the following components.

2.5.2 Exhaust Fan: Provide heavy gauge aluminum upblast centrifugal exhaust fan with integral grease drain trough and drain fitting. Provide aluminum fan wheel, statically and dynamically balanced. Motor and drive shall be isolated from the air stream and shall be cooled by clean, outside air only. Provide fully adjustable belt drive and prelubricated ball bearing motor mounted on vibration isolation equipment. Provide birdscreen and thermal barrier. Provide hinged access. The fan shall be AMCA approved and UL-listed for grease removal.

2.5.3 Supply Fan: Provide in-line, centrifugal, horizontal supply fan with painted, weatherproof finish. Provide aluminum fan wheel statically and dynamically balanced. Motor and drive shall be mounted on vibration isolation equipment. Provide high efficiency motors per Division-15 section "Motors". Provide fully adjustable belt drive and prelubricated ball bearing motor. Provide 18-gauge painted galvanized steel housing with field-painted grey finish, angle iron support legs and roof curb. Provide service access to all components.

2.5.4 Intake: Provide supply fan intake with birdscreen and 1-inch washable aluminum filters. Maximum face velocity shall be 500 fpm. Provide motorized backdraft damper that opens and closes with supply fan operation. Intake shall be at least 10' from exhaust fan.

2.5.5 Curb: Furnish 12" high (or as indicated), roofed-over type for pitched roof, prefabricated, aluminum curb with integral pressure treated wood nailer and 1-inch thick rigid insulation. Provide curb extensions and sections as required to meet NFPA requirements for exhaust discharge height and supply-exhaust fan separation.

2.5.6 Controls: Provide prewired control center complete with: remote control station at hood, master fused disconnect switch, magnetic motor starters with thermal overloads and manual reset, fused 24 volt control transformer, relays, and wiring. The system shall be UL-listed and require single point connection for fan power. The system shall provide fully automatic operation.

2.5.7 Indirect Fired Gas Heater: Provide AGA rated and UL-listed indirect fired LP gas preheater in the supply fan package. Size unit for a 40°F temperature rise based on the cfm shown on the drawings. Provide heavy duty stainless steel heat exchanger, aluminized steel burners, pilot assembly, aluminized steel furnace casing, main and pilot shutoff valves, pressure regulators, modulating gas valve, spark ignition, pilot re-light system, safety pilot, high limit, and all necessary controls. Provide cabinet to match supply fan. Provide service access to all controls and burners.

2.5.8 Accessories: Provide the following accessories for the fan package:

2.5.8.1 Two-hour time delay.

2.5.8.2 Burglar bars to prevent entry from roof.

3 EXECUTION

3.1 Install cooking hoods and fan packages as shown on the drawings, in accordance with referenced standards, and the manufacturer's written instructions.

3.2 Refer to Division-15 section "Metal Ductwork" for connection to supply and exhaust systems. Refer to other Division-15 sections for Ductwork Accessories and connections to preheaters.

3.3 Hoods shall be of sizes shown on the drawings. The depth of the canopy shall be at least 24" from the lower to upper edge. Mount cooking hoods 6'-6" above the finished floor.

3.4 Supports: Provide channels and rods to support hoods as shown on the drawings.

3.5 Piping: Seal all pipe penetration through the hood or ducts with a listed device. All fire suppression piping and nozzles shall be pre- engineered and installed in the hood as a packaged system.

3.6 Fire Extinguishing System: Install fire extinguishing systems in accordance with the manufacturer's printed instructions, the referenced standards (NFPA 17 or NFPA 17A), and the requirements of the authority having jurisdiction.

3.6.1 Piping: Install piping with a minimum of restrictions and provide for agent discharge forces, thermal expansion and contraction, and required spray patterns. Support piping securely. Test piping to ensure system is leak-free.

3.6.2 Accessories: Install remote manual pull station where shown on the drawings at 48" above finished floor. Coordinate with plumbing installer for automatic gas valve installation and with electrical installer for automatic electric power shut down, fan shut down, and fire alarm work. Shunt trip for electric power shut down, fan starters, and fire alarm work are provided by Division-16.

3.6.3 A manufacturer's representative shall check and test the installed system and provide a written certification that the system is fully operational and conforms to referenced

2.1.1 Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting.

2.1.2 Galvanized Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lockforming quality; with G 90 zinc coating in accordance with ASTM A 525; and mill phosphatized for exposed locations. Stamp gauge and manufacturer's identification on each sheet. Break sheets so that identification is exposed.

2.1.3 Stainless Steel Sheet: Where indicated, provide 18-gauge stainless steel complying with ASTM A 167; Type 304; with No. 4 finish where exposed to view in occupied spaces. Provide No. 1 finish elsewhere. Protect finished surfaces with mill-applied adhesive protective paper, maintained through fabrication and installation.

2.2 Miscellaneous Ductwork Materials:

2.2.1 General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.

2.2.2 Duct Sealant: Provide non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.

2.2.3 Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork. For exposed stainless steel ductwork, provide matching stainless steel support materials. For aluminum ductwork, provide matching supports unless materials are electrolytically separated from ductwork.

2.2.4 Flexible Ducts: Provide fiberglass cloth fabric inner liner with galvanized steel helix with factory applied 1" thick external insulation (R-6) and vapor barrier. Provide fire retardant reinforced metalized polyester jacket, complying with UL 181. Provide conical fittings with damper and without scoop for all flexible duct take offs. Provide 1" standoff for damper. Use flexible ducts only where shown on the drawings. Flexmaster 8MR6 or Thermaflex MKE R-6 ATCO 36, Gemflex SR-6A.

2.2.5 Fittings: Provide radius type fittings fabricated of multiple sections with maximum 15° change of direction per section. Unless specifically detailed otherwise, use 45° laterals and 45° elbows for branch takeoff connections. Where 90° branches are indicated, provide conical type tees.

2.3 Fabrication:

2.3.1 Shop fabricate ductwork in 4, 8, 10 or 12-ft lengths, unless otherwise indicated or required to complete runs. Preassemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated

# SECTION 15840/HVAC METAL DUCTWORK

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods Sections apply to work of this section.

1.3 Extent of HVAC metal ductwork is indicated on drawings and in schedules, and by requirements of this section.

1.4 Refer to other Division-15 sections for exterior insulation of metal ductwork.

1.5 Refer to other Division-15 sections for ductwork accessories.

1.6 Codes and Standards:

1.6.1 SMACNA Standards: Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" 1985 Edition for fabrication and installation of metal ductwork, unless otherwise noted.

1.6.2 NFPA 90A Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

1.7 Approval Submittals:

1.7.1 Product Data: Submit manufacturer's technical product data and installation instructions for the following.

1.7.1.1 Factory-fabricated ductwork

1.7.1.2 Sealants

1.7.1.3 Adhesive

1.7.1.4 Flexible duct

1.7.2 Shop Drawings: Submit scaled layout drawings of HVAC metal ductwork and fittings including, but not limited to, duct sizes, locations, elevations, and slopes of horizontal runs, wall and floor penetrations, and connections. Show interface and spatial relationship between ductwork and proximate equipment. Show modifications of indicated requirements, made to conform to local shop practice, and how those modifications ensure that free area, materials, and rigidity are not reduced.

## 2 PRODUCTS

2.1 Ductwork Materials:

2.1.1 Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting.

2.1.2 Galvanized Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lockforming quality; with G 90 zinc coating in accordance with ASTM A 525; and mill phosphatized for exposed locations. Stamp gauge and manufacturer's identification on each sheet. Break sheets so that identification is exposed.

2.1.3 Stainless Steel Sheet: Where indicated, provide 18-gauge stainless steel complying with ASTM A 167; Type 304; with No. 4 finish where exposed to view in occupied spaces. Provide No. 1 finish elsewhere. Protect finished surfaces with mill-applied adhesive protective paper, maintained through fabrication and installation.

2.2 Miscellaneous Ductwork Materials:

2.2.1 General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.

2.2.2 Duct Sealant: Provide non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.

2.2.3 Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork. For exposed stainless steel ductwork, provide matching stainless steel support materials. For aluminum ductwork, provide matching supports unless materials are electrolytically separated from ductwork.

2.2.4 Flexible Ducts: Provide fiberglass cloth fabric inner liner with galvanized steel helix with factory applied 1" thick external insulation (R-6) and vapor barrier. Provide fire retardant reinforced metalized polyester jacket, complying with UL 181. Provide conical fittings with damper and without scoop for all flexible duct take offs. Provide 1" standoff for damper. Use flexible ducts only where shown on the drawings. Flexmaster 8MR6 or Thermaflex MKE R-6 ATCO 36, Gemflex SR-6A.

2.2.5 Fittings: Provide radius type fittings fabricated of multiple sections with maximum 15° change of direction per section. Unless specifically detailed otherwise, use 45° laterals and 45° elbows for branch takeoff connections. Where 90° branches are indicated, provide conical type tees.

2.3 Fabrication:

2.3.1 Shop fabricate ductwork in 4, 8, 10 or 12-ft lengths, unless otherwise indicated or required to complete runs. Preassemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated

installation.

2.3.2 Shop fabricate ductwork of gauges and reinforcement complying with SMACNA "HVAC Duct Construction Standards". Supply duct between AHU discharge and terminal units shall be minimum 4" pressure class. Duct downstream of terminal units, supply duct from air conditioning units and all return and exhaust duct shall be minimum 2" pressure class unless otherwise noted.

2.3.3 Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1½ times associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30° for contracting tapers and 20° for expanding tapers.

2.3.4 Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division-15 section "Ductwork Accessories" for accessory requirements.

2.4 Factory-Fabricated Low Pressure Ductwork (Maximum 2" W.G.):

2.4.1 Material: Galvanized sheet steel complying with ASTM A 527, lockforming quality, with ASTM A 525, G90 zinc coating, mill phosphatized.

2.4.2 Gauge: 28-gauge minimum for round ducts and fittings, 4" through 8" diameter. 26-gauge minimum 9" through 14", 24-gauge minimum 15" through 26".

2.4.3 Elbows: One piece construction for 90° and 45° elbows 14" and smaller. Provide multiple gore construction for larger diameters with standing seam circumferential joint.

2.4.4 Divided Flow Fittings: 90° tees, constructed with saddle tap spot welded and bonded to duct fitting body.

2.4.5 Acceptable Manufacturers: Subject to compliance with requirements, provide factory-fabricated ductwork by Semco Mfg., Inc. or United Sheet Metal Div., United McGill Corp, or approved equal.

2.5 Kitchen Exhaust Ducts: Fabricate kitchen exhaust ducts and supports used for smoke and vapor removal from cooking equipment of 16-gauge minimum galvanized steel where concealed, and of 18-gauge minimum stainless steel Type 304 where exposed. For duct construction, comply with SMACNA "HVAC Duct Construction Standards", and NFPA 96 "Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment". Continuously weld all seams and joints to be grease tight.

3 EXECUTION

3.1 General: Examine areas and conditions under which HVAC metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 Installation Of Metal Ductwork:

3.2.1 General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within ⅛" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor. Seal all duct joints and seams with sealant.

3.2.2 Supports: Install concrete inserts for support of ductwork in coordination with formwork, as required to avoid delays in work. Install self-drilling screw anchors in prestressed concrete or existing work.

3.2.3 Field Fabrication: Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements. Seal joints in round or oval ductwork with hard cast or shrink bands, and sheet metal screws, or by welding. High velocity rectangular ducts shall have approved joints and be made airtight with sealer or welding.

3.2.4 Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally. Avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to ½" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. In finished and occupied spaces, conceal ductwork from view by locating in mechanical shafts, hollow wall construction or above suspended ceilings, unless specifically noted as "Exposed". Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

3.2.5 Electrical Equipment Spaces: Do not route ductwork through transformer vaults or other electrical equipment spaces and enclosures.

3.2.6 Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1½". Fasten to duct and substrate. Where ducts pass through fire-rated floors, walls, or partitions, provide firestopping between duct and substrate.

3.2.7 Coordination: Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.

3.2.8 Installation: Install metal ductwork in accordance with SMACNA HVAC Duct Construction Standards. Fan discharge outlet ducts shall be installed correctly with regard to "system effect" per AMCA Publication 201.

3.3 Installation of Flexible Ducts:

3.3.1 Maximum Length: For any duct run using flexible ductwork, do not exceed 8'-0" extended length. Flexible duct shall only be allowed as detailed on the drawings.

3.3.2 Installation: Install in accordance with Section III of SMACNA's "HVAC Duct Construction Standards, Metal and Flexible". Support flexible ducts to eliminate pinching and kinking which would restrict flow with cloth or plastic hanging straps at least 1½" wide spaced not more than 5 feet apart.

3.3.3 Seal inside of flexible duct connections to sheet metal ducts, boots and terminals. Additionally secure connection with strap clamp. Provide outer coat of sealant and insulate joint with foamed rubber insulation to avoid condensation.

3.4 Installation of Kitchen Exhaust Ducts: Fabricate joints and seams with continuous welds for watertight construction. Provide for thermal expansion of ductwork through 2000° F temperature range. Install without dips or traps which may collect residues, except where traps have continuous or automatic residue removal. Provide access openings at each change in direction, located on the sides of the duct 1½" minimum from bottom. Provide access openings with grease-tight covers of same material as duct. Slope horizontal ducts at 1" per foot.

3.5 Installation of exhaust ductwork serving areas where moisture laden air is present shall provide watertight seams. Ducts carrying moisture laden air shall be soldered galvanized steel. Ducts shall be sloped to drain without pockets. Install 1¼" drains run to safewaste where required.

3.6 Leakage Tests: After each duct system is completed, test for duct leakage in accordance with Sections 3 and 5 of the SMACNA HVAC Air Duct Leakage Test Manual. Repair leaks and repeat tests until total leakage is less than 5% of system design air flow for low pressure systems and less than 1% for systems rated over 3".

3.7 Equipment Connections: Connect metal ductwork to equipment as indicated, provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery. Provide access doors as indicated.

3.8 Clean ductwork internally free of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration. Keep ducts closed with poly during construction to prevent contamination by construction dust and debris.

3.9 Balancing: Refer to Division-15 section "Testing, Adjusting, and Balancing" for air distribution balancing of metal ductwork; not work of this section. Seal any leaks in ductwork that become apparent in balancing process.

3.10 System Adjustment: Adjust the system to provide functional operation to the extent possible, and leave ready for Testing and Balancing work. It is not the intent of this section to provide final testing and balancing, but to leave the system operational with a minimum of noise.

END OF SECTION

# SECTION 15855/DUCTWORK ACCESSORIES

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of ductwork accessories work is indicated on drawings and in schedules, and by requirements of this section.

1.4 Refer to other Division-15 sections for testing, adjusting, and balancing of ductwork accessories; not work of this section.

1.5 Codes and Standards:

1.5.1 SMACNA Compliance: Comply with applicable portions of both SMACNA "HVAC Duct Construction Standards, Metal and Flexible" and "Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems".

1.5.2 UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers". Construct, test and label smoke dampers in accordance with UL Standard 555S "Leakage Rated Dampers for use in Smoke Control Systems" .

1.5.3 NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems" pertaining to installation of ductwork accessories.

1.6 Approval Submittals:

1.6.1 Product Data: Submit manufacturer's technical product data for each type of ductwork accessory, including dimensions, capacities, and materials of construction; and installation instructions as follows:

1.6.1.1 Low pressure manual dampers

1.6.1.2 Control dampers

1.6.1.3 Counterbalanced relief dampers

1.6.1.4 Fire dampers

1.6.1.5 Duct access doors

1.6.1.6 Flexible connections

1.6.2 O&M Data Submittals: Submit manufacturer's maintenance data including parts lists for fire dampers, smoke dampers. Include this data, product data, and a copy of approval submittals in O&M manual.

2 PRODUCTS

2.1 Dampers:

2.1.1 Low Pressure Manual Dampers: Provide 16 gauge dampers of single-blade type (12" maximum blade width) or multiblade type. Damper blades to be gang-operated from a single shaft with nylon or ball bearings on each end. Provide indexed locking quadrant. Parallel or opposed blade style is acceptable. Provide 2" standoff on locking quadrant for externally insulated duct.

2.1.2 Control Dampers: Provide dampers with parallel blades for 2-position control or opposed blades for modulating control. Construct blades of 16-ga. steel. Provide heavy-duty molded self-lubricating nylon bearings and 1/2" diameter steel axles spaced on 9" centers. Provide sponge rubber or felt blade edges. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16-ga. channel for face areas over 25 sq. ft. Provide galvanized steel finish with aluminum touch-up. Actuators (motors) are provided by control contractor.

2.1.3 Counterbalanced Relief Dampers: Provide dampers with parallel blades, counterbalanced and factory-set to relieve at indicated static pressure. Construct blades of 16-ga. aluminum, provide 1/2" diameter ball bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16-ga. channel for face areas over 25 sq. ft. Provide galvanized steel finish on framewith aluminum touch-up.

2.1.4 Acceptable Manufactuers: Subject to compliance with requirements, provide dampers by Air Balance, American Warming & Ventilating, Arrow Louver and Damper, Penn Ventilator Co., or Ruskin Mfg. Co.

2.2 Fire Dampers:

2.2.1 Fire Dampers: Provide curtain type fire dampers, UL classified and labeled per UL 555, of types and sizes indicated. Construct casings and blades of galvanized steel. Damper shall not restrict duct free area when open. Dampers shall be rated for dynamic closure under flow and pressure. Provide sleeves and mounting angles. Provide fusible link rated at 160 to 165° F unless otherwise indicated. Provide damper with positive lock in closed position. All dampers shall be spring activated. Basis of design:

1-1/2 HR: Ruskin IBD2 - Style B for rectangular, Style CR for round, Style CO for oval.

1-1/2 HR: Ruskin IBDT for transfer grilles in narrow partitions.

3 HR: Ruskin IBD23 - Style B for rectangular, Style CR for round, Style CO for oval.

2.2.2 Ceiling Fire Dampers: Provide radiation dampers for protection of ceiling openings, UL

classified, of types and sizes indicated. Construct frame and blades of galvanized steel. Provide blade insulation as required by damper size. Provide fusible link rated at 160 to 165°F unless otherwise indicated. Provide diffuser radiation shield including thermal insulation blanket where required. Basis of design:

3 HR: Ruskin CFD for rectangular, CFDR for round, CFD5 for fire damper with diffuser radiation shield.

2.2.3 Acceptable Manufacturers: Subject to compliance with requirements, provide fire and smoke dampers by Air Balance, Inc., American Warning & Ventilating, Arrow Louver and Damper, Penn Ventilator Co., or Ruskin Mfg. Co.

2.3 Turning Vanes: Provide manufactured or fabricated single wall turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards".

2.4 Duct Access Doors:

2.4.1 General: Provide duct access doors of size indicated, or as required for duty indicated.

2.4.2 Construction: Construct of same or greater gauge as ductwork served. Provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.

2.4.3 Acceptable Manufacturers: Subject to compliance with requirements, provide access doors by Air Balance, Inc., Duro Dyne Corp., Ruskin Mfg. Co., or Ventfabrics, Inc.

2.5 Flexible Connections:

2.5.1 General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

2.5.2 Acceptable Manufacturers: Subject to compliance with requirments, provide products by one of the following: Duro Dyne Corp., Flexaust (The) Co., or Ventfabrics, Inc.

3 EXECUTION

3.1 Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 Installation of Ductwork Accessories:

3.2.1 Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and

in accordance with recognized industry practices to ensure that products serve intended function.

3.2.2 Install balancing dampers at all main ducts adjacent to units in return air, outside air and where indicated.

3.2.3 Install control dampers in the outside air duct return air duct for each air handler. Damper operator provided by control contractor.

3.2.4 Install turning vanes in square or rectangular 90° elbows in supply, return, and exhaust air systems, and elsewhere as indicated.

3.2.5 Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter. Install on entering air side of reheat coils. Install at fire dampers and smoke dampers. Opening size shall be per NFPA 90A for servicing fire and smoke dampers. Provide label with 1-1/2" letters to indicate location of fire protection devices.

3.2.6 Install flexible connections in ductwork such that the clear length of the connector is approximately two inches. Provide thrust restraints as required. Flexible material shall not be so slack as to take a definite concave or convex shape during fan operation.

3.2.7 Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

3.2.8 Install fire dampers within fire walls and floors at locations shown on the mechanical drawings. Install in strict accordance with the manufacturer's printed instructions, NFPA 90A, and UL 555. Basis of design installation is detailed on the drawings.

3.2.9 Install ceiling fire dampers to protect openings in rated ceilings at locations shown on the mechanical drawings. Install in strict accordance with the manufacturer's printed instructions, NFPA 90A, and UL 555. Provide diffuser radiation shields where required. Basis of design installation is detailed on the drawings.

3.3 Fire Dampers: Notify Engineer at least 24 hours in advance of ceiling installation or chase closure so that complete fire and smoke damper installation can be observed. A copy of the manufacturer's printed installation instructions shall be available at the site.

3.4 Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories as required to obtain proper operation and leakproof performance.

3.5 Adjusting And Cleaning:

3.5.1 Adjusting: Adjust ductwork accessories for proper settings. Install fusible links in fire dampers and adjust for proper action.

3.5.2 Final positioning of manual dampers is specified in Division-15 section "Testing, Adjusting, and Balancing". However, the system shall be left functional with all dampers

open or throttled.

3.5.3 Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.5.4 Furnish extra fusible links to Owner, one link for every 10 installed of each temperature range; obtain receipt.

END OF SECTION

SECTION 15860/GRILLES, REGISTERS AND CEILING DIFFUSERS

1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of air outlets and inlets work is indicated by drawings and schedules, and by requirements of this section.

1.4 Refer to other Division-15 sections for ductwork and duct accessories required in conjunction with air outlets and inlets and for balancing of air outlets and inlets; not work of this section.

1.5 Codes and Standards:

1.5.1 ADC Compliance: Test and rate air outlets and inlets in certified laboratories under requirements of ADC 1062 "Certification, Rating and Test Manual". Provide air outlets and inlets bearing ADC Certified Rating Seal.

1.5.2 NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

1.6 Approval Submittals:

1.6.1 Product Data: Submit manufacturer's technical product data for air outlets and inlets indicating construction, finish, and mounting details.

1.6.2 Performance Data: For each type of air outlet and inlet furnished, provide aspiration ability, temperature and velocity traverses, throw and drop, and noise criteria ratings. Indicate selections and data as required.

1.7 O&M Data Submittals: Submit cleaning instructions for finishes and spare parts lists. Include this data and a copy of approval submittals in O&M manual.

2 PRODUCTS

2.1 General:

2.1.1 Except as otherwise indicated, provide manufacturer's standard grilles, registers, and ceiling diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.

2.1.2 Manufacturers not listed in the following specification will not be considered for approval unless accepted by addendum prior to bid.

2.1.3 Performance: Provide grilles, registers and ceiling diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device equal to the basis of design.

2.1.4 Ceiling and Wall Compatibility: Provide grilles, registers and diffusers with border styles that are compatible with adjacent wall and ceiling systems, and that are specifically manufactured to fit into ceiling module or wall with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems and walls which will contain each type of ceiling diffuser, grille, or register. All ceiling and wall-mounted grilles, registers and diffusers shall be provided with gaskets to seal them with the building envelope.

2.1.5 Appearance: All grilles and registers shall be aluminum construction and all diffusers shall be steel or aluminum construction, unless otherwise noted, with uniform matching appearance for each type of outlet. Ceiling mounted grilles and registers shall be set to be sight tight from the predominant exposure.

2.1.6 Finish: All ceiling mounted grilles, registers, and diffusers shall be finished with baked white enamel. Wall and door mounted grilles and registers shall be finished with clear anodized finish baked white enamel.

2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products by Titus or Metal Aire.

2.3 Square Ceiling Diffusers (CD): Provide square face, adjustable, 360 degree pattern diffusers with one-piece stamped cones, no corner joints, round necks. Provide lay-in panel as required. Provide trim ring for diffusers in hard ceilings to allow opening to be used for access. Diffusers with 24 x 24 face: Titus TMSA-AA, Metalaire 5700 A -A .Diffusers with 12 x 12 face: Titus TMS -AA, Metalaire 5800 -A

2.4 Return Grilles and Registers (RAR): Provide perforated face lay-in return grilles with square-to-round neck transition. Provide opposed blade damper in the duct takeoff. Provide mounting frame for all wall and plaster ceiling installations. Titus Model PAR.

2.5 Exhaust Grilles and Registers (ER): Provide exhaust registers with one set of 45 degree fixed louvers, parallel to the long dimension. Provide opposed blade damper, screwdriver operated from the face. Provide mounting frame for all wall and plaster ceiling installations. Titus 350 FL or Metalaire RHE.

2.6 Sidewall Supply Registers (SR): Provide supply registers with two sets of individually adjustable airfoil registers, spaced at ¾", with the front set parallel to the long dimension. Provide opposed blade damper, screwdriver operated from the face. Provide mounting frame. Titus 272-FL or Metalaire 4004.

2.7 Transfer Grilles (TG): Provide transfer grilles with one set of 45 degree fixed louvers, parallel to the long dimension. Titus 350 FL or Metalaire RHE.

2.8 Filter Return Grilles (FRG): Provide filter return grilles with one set of 45 degree, fixed louvers, parallel to the long dimension. Provide frame and hinged core with provision for

one two inch thick filters. Titus 350FF or Metalaire RHEF.

2.9 Soffit Grilles (SG): Provide heavy duty steel aluminum soffit grilles with one set of 45 degree fixed louvers, parallel to the long dimension with support bars. Provide ½" square mesh anodized aluminum wire bird screen behind the grille. Provide mounting frame for all plaster installations. Titus 350 FL or Metalaire RHE.

2.10 Door Grilles (DG): Provide steel door grilles with vee core, fixed louvers, spaced ½", flanged frame, and telescoping auxiliary flanged frame. Provide prime coat ready for field painting. Titus T-700 or Metalaire DGDF

3 EXECUTION

3.1 Coordinate installation with ceiling and light fixture installation. Locate ceiling outlets as indicated on architectural Reflected Ceiling Plans. Unless otherwise indicated, locate ceiling outlets in the center of acoustical ceiling modules with sides parallel to the grid.

3.2 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 functions.

3.3 Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.

3.4 Set air volumes to values shown on the drawings so that the system is functional. Leave ready for test and balance contractor.

3.5 Furnish to Owner three operating keys for each type of outlet and inlet that require them; obtain receipt.

END OF SECTION

SECTION 15875/WALL LOUVERS

1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of wall louver work is indicated by drawings and schedules, and by the requirements of this section.

1.4 Refer to other Division-15 sections for ductwork, duct accessories and controls work.

1.5 AMCA Compliance: Test and rate louvers in accordance with AMCA Standard 500. Provide AMCA certified rating seal.

1.6 Approval Submittals:

1.6.1 Product data: Submit manufacturer's technical product data for louvers including: model number, accessories furnished, construction, finish, mounting details, performance data.

1.7 O&M Data Submittals: Submit maintenance data, including cleaning of finishes and a copy of approval submittals. Include in O&M manual.

2 PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, submit products by Ruskin, Arrow, American Warming and Ventilating, or AMCA labeled approved equal.

2.2 General: Except as otherwise indicated, provide manufacturer's hurricane-proof (100 mph resistant) louvers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation. Provide Kynar 500 coated, corrosion resistant finish; color to be selected by the Architect.

2.3 Substrate Compatibility: Provide louvers with 4 inch frame, flange and sill extension piece that are compatible with adjacent substrate, and that are specifically manufactured to fit into construction 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.

2.4 Materials: Construct of aluminum extrusions, ASTM B 221, Alloy 6063-T5. Weld units or use stainless steel fasteners.

2.5 Louver Screens: On inside face of exterior louvers, provide 1/2" square mesh anodized aluminum wire bird screens mounted in removable extruded aluminum frames.

2.6 Stationary Louvers: For louvers 24 inches high and less - Construction Specialties Model 7034.

3 EXECUTION

3.1 Install where shown on the drawings in accordance with the manufacturer's printed instruction. Exercise care to prevent scratches.

3.2 Verify size of louvers shown on drawings prior to fabrication. Coordinate with wall openings. Sizes may be altered subject to approval by Engineer provided free area remains approximately the same as indicated.

3.3 Refer to other Division-15 sections for controls work.

END OF SECTION

# SECTION 15905/HVAC SEQUENCE OF OPERATION

## 1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Sequence of operation is hereby defined as the manner and method by which controls function. Requirements for each type of control system operation are specified in this section.

1.4 Operating equipment, devices, and system components required for control systems are specified in other Division-15 Controls' sections of these specifications.

## 2. PRODUCTS

2.1 Provide Honeywell 7300 or 7400 programable auto changeover thermostat with 3-stage heat as indicated, night setback, and auxiliary contacts for each AC unit. Provide a time clock to provide specified sequence of operation.

## 3. EXECUTION

3.1 HVAC Zone Control Sequences:

3.2 Exhaust Fan Control: Energize exhaust fans with speed controllers or wall switches or by interlocks with the outside air units as indicated.

3.3 Heat Pump Controls: The units shall be energized and controlled by a programmable automatic changeover thermostat. The units shall start one hour before the building is occupied and stop one hour after the building is unoccupied. All outside air for split system heat pump units shall be precooled by the 100% outside air unit. Thermostat with automatic change over shall cause the heat pump to heat or cool. The fan shall operate continuously. Above 75ºF (adjustable) room temperature, the unit shall be in cooling. Below 70ºF (adjustable) return air temperature, the unit shall be in heating. All control wiring, controllers, sensors and conduit shall be provided by the mechanical contractor.

3.3.1 In the heating mode the first stage of the controller shall energize heating by the heat pump. The second and third stages of the thermostat shall energize the supplemental electric heat. Electric heat shall also be energized during the defrost cycle.

3.4 Preconditioning, Direct Expansion, 100% Outside Air Units: this direct expansion A.C. unit provides preconditioned outside air to the split system heat pump units and to the patient rooms.

3.4.1 Units shall be energized (only when the building is occupied) and de-energized by a time

clock. This unit shall cool, heat, and dehumidify outside air for the split system heat pumps and patient rooms. The unit fan shall be energized by the time clock and the motorized outside air damper shall open when the building is occupied.

3.4.2 An outside air control shall start the compressor when the outside air is above 60ºF. The unit shall cool the air to 56ºF to dehumidify the air and then hot gas bypass will unload unit and hot gas reheat shall be activated to maintain a constant discharge temperature of 74ºF (adjustable). All controls shall be 24V and shall be provided and wired by the unit manufacturer.

3.4.3 The units electric heat shall be energized when the entering air to the unit falls below 50ºF. Provide stages as indicated in the schedules.

3.5 Packaged terminal heat pumps shall be provided in patient rooms and elsewhere as indicated. Controls shall be self-contained with remote wall-mounted thermostats. Under an additive alternate, provide remote monitoring and control of these units.

END OF SECTION

SECTION 15925/ENERGY MANAGEMENT CONTROL AND DDC SYSTEM - ADDITIVE ALTERNATE

1.0 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of Energy Management Control And DDC Systems (EMCS/DDC) work required by this section is indicated on drawings and input/output schedules, and by requirements of this section. Control sequences are specified in Division-15 section "HVAC Sequence of Operation".

1.4 Refer to other Division-15 sections for installation of automatic temperature controls, instrument wells, valve bodies, and dampers in mechanical systems; not work of this section.

1.5 Refer to Division-16 sections for the following work; not work of this section.

1.5.1 Power supply wiring for power source to power connection on controls and/or EMCS panels. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

1.5.2 Interlock wiring (120 volt and greater) between electrically-operated equipment units; and between equipment and field-installed control devices. Interlock wiring specified as factory-installed is work of this section.

1.6 Provide the following electrical work as work of this section, complying with requirements of Division-16 sections: Control wiring (24 volt) between field-installed controls, indicating devices, and EMCS panels.

1.7 Codes and Standards:

1.7.1 Electrical Standards: Provide electrical products which have been tested, listed and labeled by UL and comply with NEMA standards.

1.7.2 NEMA Compliance: Comply with NEMA standards pertaining to components and devices for electric control systems.

1.7.3 NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.

1.7.4 Federal Communication Commission (FCC) as required.

1.8 Submittals:

1.8.1 Product Data: Submit manufacturer's technical product data for each EMCS/DDC panel and control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, and including installation instructions and start-up instructions. Provide technical specification data for each component and software module.

1.8.2 Shop Drawings: Submit shop drawings for the EMCS/DDC containing the following information:

Schematic flow diagram of system showing fans, pumps, coils, dampers, valves, and control devices.

Label each control device with setting or adjustable range of control.

Indicate all required electrical wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed. A complete schematic shall show all interconnections.

Provide details of faces of EMCS/DDC panels, including controls instruments, and labeling.

Include written description of sequence of operation.

1.8.3 Maintenance Data: Submit maintenance instructions and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division 1.

1.8.4 System Manual: In addition to the Operation and Maintenance manuals requirements, provide an EMCS/DDC Owner's Manual in a separate binder specifically for this project. This manual shall provide a description of the information flow to and from panels and devices and shall describe the overall communications network. The manual shall also include operating instructions, block diagrams, schematics, schedules, and system descriptions. Instruct Owner's personnel with this manual during the required training periods.

1.8.5 Software: Submit software.

1.8.6 Service: Name, address, and telephone number of company that will provide service and training for the system.

1.9 Quality Assurance:

1.9.1 Provide equipment of firms regularly engaged in manufacture of EMCS/DDC equipment, of types required, whose products have been in satisfactory use in similar service for not less than three years. Provide evidence that software has been in use satisfactorily for at least one year.

1.9.2 Contractor shall have at least three years experience in the installation and servicing of EMCS/DDC equipment similar to that being installed. Contractor shall have an office within 100 miles of the project and shall maintain a remote terminal capable of

communication with the EMCS/DDC during the one year guarantee period.

2.0 PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide an EMCS/DDC of one of the following:

KMC Controls
Allerton
Automated Logic

2.2 General: Provide EMCS/DDC products in sizes and capacities indicated, consisting of panels, relays, switches, sensors, controllers, and other components as required for complete installation. Except as otherwise indicated, provide manufacturer's standard control system components as indicated by published product information, designed and constructed as recommended by manufacturer. Provide an EMCS/DDC with the following functional and construction features as indicated.

2.2.1 Provide all necessary end devices such as sensors, actuators, valves, and relays.

2.3 EMCS/DDC Panels:

2.3.1 Provide field-programmable microprocessor-based, stand-alone EMCS/DDC panels as specified herein. The EMCS/DDC panel manufacturer shall be responsible for the complete engineering of the panel. The panel shall be UL listed and be housed in a key locked metal cabinet. Parts shall be plug in (modular) for easy field repair and/or expansion. Power input shall be 24V or 120V, single phase, 60 Hz. Relays and contacts shall be rated at 24 VA at 24 VAC or 125 VA at 120 and 230 VAC, as required.

2.3.2 The panels shall have the capability to be upgraded through modules.

2.3.3 Programming must utilize low level English language.

2.3.4 Coordinate with the EMCS/DDC manufacturer and ensure that all wire and conduit (type and size) is suitable for the equipment being installed.

2.3.5 Each EMCS/DDC panel shall have at least the minimum number of output and input channels for controlling loads as shown on the drawings.

2.3.6 Panels shall have a keyboard with an access code to prevent unauthorized entry. The keyboard shall be used to display setpoints and valves, and for override and programming.

2.3.7 L.E.D. visual display shall provide prompted programming and shall indicate all system parameters including current time, day and month and error messages.

2.3.8 Provide for 48 hours minimum of battery backup for field programs in RAM. All logic, utility, calculations, and control functions shall be in ROM.

2.3.9 The control console shall have the capability to communicate with other system

components by using a two-wire communication line.

2.3.10 The system shall be driven by a line power synchronized program clock. Clock display shall include year, month, day of month and time in hours, minutes and seconds. The clock shall also automatically update for days in month, daylight savings time, and leap year.

2.3.11 Programming shall be self-prompting such that the operator is guided to the next entry item. Field programming shall be readily accomplished by the user.

2.3.12 Diagnostics and Serviceability: Provide built-in, self-testing for lights, digital display, and memory. Provide all electronics in modular form of the plug-in type.

2.3.13 Control Functions: Provide for closed-loop control by proportional, proportional-integral (PI), proportional-integralderivative (PID), incremental, and/or floating modes. Control accuracy: plus or minus 0.5° F of set point for all steady state load conditions.

1. Supply Air Temperature Reset: Provide for reset based on outdoor air temperature or other parameter.

2. Space temperature monitoring.

2.3.14 Management Functions: Provide capability for trending of variables, totalizing, and historical data storage. Provide for monitoring of selected parameters locally and remotely.

2.3.15 Time of Day Programming: Provide ON-OFF control with one minute resolution, multiple ON-OFF cycles per day, full year holiday programming, automatic change to and from daylight savings time.

2.3.16 Automatic Restart Programming: Provide for sequential automatic restart of all equipment in the normal mode following a power outage.

2.3.17 Alarms: Provide alarms for control points out of range (adjustable) and provide alarm summary capability.

2.4 EMCS/DDC Associated Components:

2.4.1 Communication Module: The EMCS/DDC shall be supplied with all necessary communication modules and hardware as required for a remote panel to program and recall data. Provide all required cable and conduit to link to the host computer. Provide all necessary equipment to allow remote programming and monitoring of input channels and on/off status from the remote system. Provide download capability from the host computer.

2.4.2 Hardware: Provide key-locked NEMA-1 metal cabinet, modular components for expandability and maintenance, keyboard entry, battery backup to prevent loss of

memory for at least 48 hours, local manual override, AC line voltage surge protection.

2.4.3 Channel Bypass and Override: Provide bypass switches for each output channel such that the controlled device can operate normally as if the EMCS/DDC was not installed. Provide remote override timers where shown in the input/output schedule on the drawings.

2.5 Guarantee:

2.5.1 All components, parts, and assemblies shall be guaranteed against defects in material and workmanship for a period of one year after acceptance. Expressed warranties are conditionally based on the requirement that the items covered within the guarantee are used and maintained in accordance with the manufacturer's recommendations. Guarantee commences at time of acceptance and continues for one year. Acceptance shall not occur until the Owner's operators are able to use the EMCS/DDC and receive reliable information from inputs and outputs.

2.5.2 The first year guarantee shall, as part of the base bid for the EMCS/DDC, include full service and maintenance of the EMCS/DDC. This service and maintenance shall include all necessary repair, reprogramming, calibration, cleaning, minimum (4) quarterly inspections, call back service, etc. This first year service, maintenance and guarantee shall be included in the base bid of the EMCS/DDC.

2.6 Associated Hardware: Provide actuators, relays, and other interface devices as required to execute the indicated control functions. Coordinate with Division-15 section "HVAC Control Sequences" and the input/output schedule on the drawings.

2.7 Temperature Sensors: Provide resistance temperature detector (RTD) type sensors for duct, well, or room mounting as required by duty indicated. Accuracy: plus or minus 0.5° F.

2.7 Temperature Transmitters: Provide 3 or 4 wire resistance temperature detector (RTD) type transmitters for duct, well, or room mounting as required by duty indicated. Provide metal enclosure sealed against moisture. Accuracy: plus or minus 0.25°F. Install wells to accommodate sensors. Wells must be of sufficient size to allow insertion of an electronic probe with the sensor for calibration. Accutech AI-1000 or approved equal.

2.8 Transducers: When transducers may be subject to fouling by entrained oil in pneumatic supply, provide protective filters.

3.0 EXECUTION

3.1 Examine areas and conditions under which EMCS/DDC work is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.

3.2 Installation of EMCS/DDC:

3.2.1 General: Install systems and materials in accordance with manufacturer's instructions and roughing-in drawings, and details on drawings. Install electrical components and use electrical products complying with requirements of applicable Division-16 sections of these specifications. Mount panels at convenient locations and heights.

3.2.2 Control Wiring: The term "control wiring" is defined to be 24 volts and lower and includes providing of wire, conduit and miscellaneous materials as required for mounting and connecting electric control devices.

3.2.3 Wiring System: Install complete control wiring system for the EMCS/DDC. Conceal wiring, except in mechanical rooms and areas where other conduit and piping are exposed. Provide multi-conductor instrument harness (bundle) in place of single conductors where number of conductors can be run along common path. Fasten flexible conductors bridging cabinets and doors, neatly along hinge side, and protect against abrasion. Tie and support conductors neatly.

3.2.4 Install control wiring in accordance with the National Electric Code and Division 16 requirements.

3.2.5 Number-code or color-code conductors, excluding those used for local individual room controls, appropriately for future identification and servicing of control system. Tag all sensor wiring to identify zone number and room number where sensor is located.

3.3 Programming of EMCS/DDC:

3.3.1 The Contractor shall obtain operational schedules for the controlled equipment from the Engineer. Submittal data relevant to operational schedules shall be forwarded from the Contractor to the Engineer. Upon receipt of approval, the Contractor shall proceed with installation, setup, calibration and check out of the various control and monitoring systems.

Having completed component and system installation, the Contractor shall submit a written request to the Engineer to inspect and approve their satisfactory operation.

3.3.2 The EMCS/DDC shall perform all functions on the equipment as called for in the input/output schedule on the drawings. This schedule, in conjunction with the rest of the drawings, defines the scope and extent of the project with regard to the required number of panels, control point relays, and devices. Field verify voltages at point-of-interface and provide relays as required.

3.3.3 Input/output schedules may be altered during constuction as necessary to meet the Owner's requirements. Provide additional relays and devices as required.

3.3.4 Channel numbers may be reassigned by the Contractor during shop drawing submittal.

3.3.5 Model numbers, horsepowers, voltages, etc., of equipment where listed on the drawings are for Contractor's convenience. Verify all information in the field as necessary for

preparation of shop drawings.

3.4 Functional Requirements of EMCS/DDC:

3.4.1 Install and program the complete EMCS/DDC to accomplish all functions for all equipment as described in Division-15 section "HVAC Control Sequences" and/or listed in the input/output schedule and shown on the drawings.

3.4.2 Provide all necessary relays, sensors, wiring, and contacts to achieve proper operation.

3.4.3 Connect EMCS/DDC panels to remote panels where shown.

3.5 Adjusting and Cleaning:

3.5.1 Start-up: Start-up, test, and adjust the EMCS/DDC in presence of manufacturer's authorized representative. Demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

3.5.2 Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.5.3 Final Adjustment: After completion of installation, adjust the program, relays, interface devices, and similar equipment provided as work of this section for optimum operation.

3.6 System Adjustment: The drive/controller supplier shall set all adjustments and setpoints for initial operation. The system and all pumps and control valves shall be monitored for proper operation. It shall be recognized that final settings will be obtained by trial-and-error by necessity. Call backs to achieve proper settings shall be included in the base bid.

3.7 Owner's Instructions:

3.7.1 During system commissioning and at such time acceptable performance of the EMCS/DDC hardware and software has been established, the Contractor shall provide on-site operator instruction. This instruction shall be performed during normal working hours and shall be conducted by a competent representative of the Contractor familiar with the system's software, hardware and accessories.

3.7.2 At a time mutually agreed upon during system commissioning as stated above, the Contractor shall give up to 16 hours (as needed) of instruction to the Owner's designated personnel on the operation of all equipment within the EMCS/DDC and describe its intended use with respect to the programmed functions specified.

3.7.3 Operator orientation of the EMCS/DDC will include, but not be limited to, the overall operational program, equipment functions both individually and as part of the total integrated system, commands, advisories, and appropriate operator intervention required in responding to the EMCS/DDC operation.

3.7.4 Provide at least 14-day notice to Owner and Engineer of training dates.

3.8 System Verification: The manufacturer's authorized representative shall state in writing to the Engineer that the EMCS/DDC system is operating properly, final adjustments and calibrations are complete, and Owner training has been accomplished.

END OF SECTION

# SECTION 15970/START-UP REQUIREMENTS FOR HEATING, VENTILATING, & AIR CONDITIONING (HVAC) SYSTEMS

## 1 GENERAL

1.1 Intent: It is the intent of this section to require that the startup requirements and report noted herein be performed prior to starting TAB work on each system. Work can be phased with permission of the Engineer.

1.2 Coordination:

1.2.1 The Contractor shall furnish to the TAB Contractor a complete set of plans, specifications, addenda, shop drawings, equipment performance data sheets, change orders, etc. as requested by the TAB Contractor.

1.2.2 The Contractor shall participate in a TAB coordination meeting to discuss interface requirements with the TAB Contractor and to establish a schedule for TAB work prior to start of TAB work.

## 2 PRODUCTS: None

## 3 EXECUTION:

3.1 The TAB work shall not commence until the Engineer has received written notice from the Contractor that HVAC systems are 100% complete and are fully operational.

3.2 The Contractor shall place all HVAC systems and equipment into complete operation during each working day of TAB work.

3.3 The Contractor shall provide access to HVAC systems and equipment by supplying ladders and/or scaffolding, and opening access panels and equipment room doors.

3.4 The TAB Contractor will provide to the Contractor TAB punch lists of non-complying HVAC work as they are discovered. The Contractor shall replace or repair non-complying work as soon as possible in order not to delay completion of TAB work.

3.5 If the TAB Contractor is prevented from completing his work in a timely and continuous manner (according to the established TAB schedule) due to non-operable and/or incomplete HVAC systems, any additional fees for TAB work shall be the responsibility of the Contractor and shall be affected by change order reducing the Contract Amount.

3.6 The contract will not be closed out until all HVAC systems have been successfully TABed by the independent TAB contractor.

3.7 Airside Systems: The Contractor shall provide the following information to the Engineer to substantiate proper start-up and preliminary adjustments of air handler units, belt driven fans, and duct systems.

3.7.1 Verify that air grilles (supply, return, exhaust, transfer, outdoor, etc.) are installed and connected to the duct system.

3.7.2 Verify that duct systems are clean of debris.

3.7.3 Verify that ducts attached with flexible connectors are aligned within ½" and have a uniform gap between ducts of 1"-1.5". Flexible connectors shall not leak and shall be insulated.

3.7.4 Verify that filters are clean and filter spacers are installed.

3.7.5 Verify that balancing dampers at grilles and branch ducts are operational and are fully opened.

3.7.6 Verify that fire and smoke dampers are correctly installed and are fully opened.

3.7.7 Verify that fan discharges are appropriate for the outlet ductwork with regards to the "system effect" per AMCA Publication 201. Inappropriate fan discharges will not be accepted.

3.7.8 Verify proper fan rotation.

3.7.9 Verify proper belt drive alignment.

3.7.10 Verify fan motor overload elements are correctly sized.

3.7.11 Adjust fan sheave until CFM is at or above design CFM. Provide additional sheaves and belts as required. Verify that motor is not overloaded.

3.7.12 Verify that HVAC control systems are fully operational.

END OF SECTION

# SECTION 15985/TESTING AND BALANCING OF MECHANICAL SYSTEMS

## 1 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section. Division-15 Basic Mechanical Materials Sections apply to work of this section.

1.1 The work of this section is intended to be performed by a test and balance contractor under a separate, stand-alone contract.

1.2 Description of Work:

1.2.1 Extent of testing, adjusting, and balancing work (TAB) is indicated by requirements of this section, and also by drawings and schedules, and is defined to include, but is not necessarily limited to, air distribution systems, hydronic distribution systems and associated equipment and apparatus of mechanical work. The work consists of setting speed and volume (flow) adjusting facilities provided for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to work as required.

1.2.2 Pretesting: Where required by the drawings or other Division 15 sections, pretest existing HVAC systems as directed and report findings prior to start of demolition work or any other modifications to the existing systems. Results of pretesting shall be reported to the Engineer in a timely manner. Comply with standards for final TAB reports described herein.

1.2.3 Coordination: Coordinate with the General Contractor and Mechanical Contractor responsible for the HVAC system installation as required to complete the TAB work.

1.3 The intent of this specification is to balance HVAC systems within the tolerances listed, maintaining the pressure relationships indicated, with a minimum of noise.

1.3.1 Airflow Tolerances:

1.3.1.1 Air Handling: The supply air, return air and outdoor air quantities shall be balanced within ±5% of design values.

1.3.1.2 Exhaust Fans: The exhaust fan quantities shall be set as required to maintain the design exhaust terminal flows within ±5% of design values. If no exhaust terminals exist, exhaust fan air quantities shall be balanced within ± 10% of design values.

1.3.1.3 Terminal Units: The air quantities associated with heat recovery units, unit heaters and other similar devices shall be balanced within ±5% of design values.

1.3.1.4 Ceiling Diffusers, Supply Registers, Return and Exhaust Inlets: Balance to an air quantity within ±10% of the design values.

1.3.2 Temperature Tolerances:

1.3.2.1 Air Handling Temperatures: The controlled temperatures at AHUs shall be verified to be under control within ± 1°F of design values.

1.3.2.2 Room Temperatures: Balance systems and controls within ±2°F of indicated settings.

1.3.3 Pressure Relationships: Where code or design indicates a specific pressure relationship, the pressure relationship shall take precedence over airflow tolerances. Airflow tolerances may need to be held tighter than allowed tolerances to meet pressure relationships. Demonstrate the existence of positive or negative pressure to Engineer and authority having jurisdiction by making direct measurements of room relative pressure and/or flow direction.

1.4 Quality Assurance: The TAB Contractor shall be certified as follows:

1.4.1 Tester: A firm certified by National Environmental Balancing Bureau (NEBB) in those testing and balancing disciplines required for this project, who is not the Installer of the systems to be tested and is otherwise independent of the project. Comply with NEBB's "Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems" as applicable to this work.

1.4.2 Tester: A firm certified by Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this project. AABC-certified firms are independent by definition. Comply with AABC's Manual MN-1 "AABC National Standards", as applicable to this work.

1.4.3 Industry Standards: Comply with American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise indicated.

1.5 Job Conditions:

1.5.1 Do not proceed with testing, adjusting, and balancing work until HVAC work (including Controls) has been completed and is operable. Ensure that there is no residual work still to be completed.

1.5.2 Do not proceed until work scheduled for testing, adjusting, and balancing is clean and free from debris, dirt and discarded building materials.

1.5.3 Do not proceed until architectural work that would affect balancing (walls, ceiling, windows, doors) have been installed.

1.5.4 Testing may proceed system by system, but each HVAC system must be complete as describe herein.

1.5.5 The mechanical contractor shall make any changes in pulleys, belts, and dampers, and/or add dampers as required for correct balancing.

1.6 Approval Submittals

1.6.1 Submit the name of the proposed test and balance company for the Engineer's approval within thirty (30) days after awarding of contract.

1.7 Test Reports and Verification Submittals:

1.7.1 Submit four (4) copies of the dated test and balance report upon completion of TAB work. The report shall include a list of instruments used for the work. The report shall be signed by the supervisor who performed the TAB work. The report shall be certified by a professional engineer (registered in Florida) who is a regular employee of the TAB company.

2 PRODUCTS

2.1 Patching Materials: Except as otherwise indicated, use same products as used by original Installer for patching holes in insulation, ductwork and housings which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.

2.2 Test Instruments: Utilize test instruments and equipment of the type, precision, and capacity as recommended in the referenced standard. All instruments shall be in good condition and shall have been calibrated within the previous six (6) months (or more recently if required by standard).

3 EXECUTION

3.1 General:

3.1.1 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 manner acceptable to Tester.

3.1.2 Test, adjust and balance environmental systems and components, as indicated, in accordance with procedures outlined in applicable standards, and as modified or detailed herein.

3.1.3 Test, adjust and balance systems during summer season for air conditioning systems and during winter season for heating systems, including at least a period of operation at outside conditions within 5°F wet bulb temperature of maximum summer design condition, and within 10°F dry bulb temperature of minimum winter design condition. When seasonal operation does not permit measuring final temperatures, then take final temperature readings when seasonal operation does permit. The Contractor shall return for a change of seasons test at no additional cost to the Owner and submit the revised TAB report.

3.1.4 Punch List: Prepare a deficiency (punch)list for the Contractor with a copy of the Engineer that lists all items that are incorrectly installed or are functioning improperly. Provide a retest after all items are corrected.

3.1.5 Prepare TAB report of test results, including instrumentation calibration reports, in format recommended by applicable standards, modified as required to include all data listed herein.

3.1.6 Patch holes in insulation, ductwork and housings, which have been cut or drilled for test purposes, in manner recommended by original Installer.

3.1.7 Mark equipment settings, 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.

3.1.8 Include in the TAB report recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

3.1.9 Include an extended warranty of ninety (90) days after completion of test and balance work, during which time the Engineer, at his discretion, may request a recheck, or resetting of any component as listed in test report. The TAB company shall provide technicians and instruments and make any tests required by the Engineer during this time period.

3.2 Controls

3.2.1 Check all HVAC controls for proper location, calibration and sequence of operation.

3.2.2 Check operation of all controllers and controlled devices to verify proper action and direction. Check the operation of all interlocks.

3.2.3 Check all motorized damper motors for leakage when in closed position. If leakage is more that 5%, mechanical contractor shall reset damper linkages.

3.2.4 Check all control valves for complete closure and correct action under all operating conditions.

3.3 Air Balancing

3.3.1 Leakage tests on ductwork must have been completed before air balancing.

3.3.2 Set dampers, volume controls and fan speeds to obtain specified air delivery with minimum noise level. Rebalance as required to accomplish this.

3.3.3 Set grille deflections as noted on plans. Modify deflections if required to eliminate drafts or objectionable air movement.

3.3.4 Record air terminal velocity after completion of balance work.

3.3.5 Record final grille and register deflection settings if different from that specified on contract drawings.

3.3.6 Record all fan speeds.

3.4 Data Collection:

3.4.1 In addition to the data required for any specified performance tests, measure and record the temperatures, pressures, flow rates, and nameplate data for all components listed herein.

3.4.2 It is the intent of this section to record data on balanced systems, under normal operating or design conditions.

3.4.3 Temperatures:

1. Outside dry and wet bulb temperatures.
2. Dry bulb temperature in each room and at least one wet bulb temperature in each zone.
3. Refrigerant liquid and suction temperatures.

3.4.4 Pressures:

1. Suction and discharge static pressure of each fan.
2. Each refrigerant suction and discharge pressure.
3. Water pressure drop through each heat exchanger.

3.4.5 Flow rates:

1. Flow rate through each fan.
2. Flow rate through each coil or heat exchange device.

3.4.6 Nameplate Data:

1. Complete nameplate data for all equipment.
2. Motor data to include horsepower, phase, voltage, RPM, full load nameplate current, fuse rating in disconnect switch, number or manufacturer's size designation, and ampere rating of overcurrent and low voltage protection devices in starters.

END OF SECTION

SECTION 16005/ELECTRICAL GENERAL

1. GENERAL

1.1 The work covered by this division consists of providing all labor, equipment and materials and performing all operations necessary for the installation of the electrical work as herein called for and shown on the Drawings.

1.2 Related Documents:

1.2.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2.2 Provisions of this Section apply to work of all Division 16 Sections.

1.2.3 Review all project Drawings to be aware of conditions affecting work herein.

1.2.4 Definitions:

1.2.4.1 Provide: Furnish, install, and test, complete and ready for intended use.

1.2.4.2 Furnish: Supply and deliver to project site, ready for subsequent requirements.

1.2.4.3 Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, test complete ready for intended use, and similar requirements.

1.3 Permits and Fees: Contractor shall obtain all necessary permits, meters, and inspections required for his work and pay all fees and charges incidental thereto.

1.4 Verification of Owner's Data: Prior to commencing work the Contractor shall satisfy himself as to the accuracy of all data indicated on the Drawings and/or provided by the Owner. Should the Contractor discover any inaccuracies, errors, or omissions in the data, he shall immediately notify the Engineer. Commencement of work by the Contractor shall be held as an acceptance of the data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions or inaccuracies of the said data.

1.5 Delivery and Storage of Materials: Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. All material shall be stored to provide protection from the weather and damage.

1.6 Extent of work is indicated in the Drawings, Schedules, and Specification. Singular references shall not be construed as requiring only one device if multiple devices are shown on the Drawings or are required for proper system operation.

1.7 Field Measurements and Coordination:

1.7.1 The intent of the Drawings and Specifications is to obtain a complete and satisfactory

installation. Separate divisional Drawings and Specifications shall not relieve the Contractor or Subcontractors from full compliance of work of his trade indicated on any of the Drawings or in any Section of the Specifications. Report conflicts prior to start of work.

1.7.2 Verify all field dimensions and locations of equipment to insure close, neat fit with other trades' work. Make use of all Contract Documents and approved shop drawings to verify exact dimension and locations. Do not scale electrical drawings, rely on dimensions shown on architectural or structural drawings.

1.7.3 Coordinate work in this Division with all other trades in proper sequence to insure that the total work is completed within Contract time schedule and with minimum cutting and patching.

1.7.4 Locate all equipment, materials, and apparatus symmetrical with architectural elements. Install to exact height and locations when shown on architectural drawings. When locations are shown only on electrical drawings, be guided by architectural details and conditions existing at job and correlate this work with that of others.

1.7.5 Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings and passageways. Cut no structural members without written approval from Engineer or Architect.

1.7.6 Carefully examine any existing conditions, piping, and premises. Compare Drawings with existing conditions. Report any observed discrepancies. Written instructions will be issued by the Engineer to resolve discrepancies.

1.7.7 Because of the small scale of the Drawings, it is not possible to indicate all offsets and fittings or to locate every accessory. Drawings are essentially diagrammatic. Study carefully the sizes and locations of structural members, wall and partition locations, trusses, and room dimensions and take actual measurements on the job. Locate material, equipment and accessories with sufficient space for installing and servicing. Contractor is responsible for accuracy of his measurements and shall not order materials or perform work without verification. No extra compensation will be allowed because field measurements vary from the dimensions on the Drawings. If field measurements show that equipment or material cannot be fitted, the Engineer shall be consulted. Remove and relocate, without additional compensation, any item that is installed and is later found to encroach on space assigned to another use.

1.8 Guarantee and Service:

1.8.1 Owner reserves the right to make emergency repairs as required to keep equipment in operation without voiding Contractor's Guarantee Bond nor relieving Contractor of his responsibilities during guarantee period.

1.9 Shop Drawings:

1.9.1 Before ordering any materials or equipment, and within 30 days after the award of Contract the Contractor shall submit to the Engineer one complete schedule showing the

make, type, manufacturer's name and trade designation of all equipment.

1.9.1.1 This schedule shall be accompanied by six (6) copies of the manufacturer's printed specifications and shop drawings for each piece of equipment or specialty and shall give dimensions, diagrams, descriptive literature, capacity or rating, kind of material, finish, guarantee, etc., and such other detailed information as the Engineer may require.

1.9.1.2 When approved, such schedule shall be an addition to these Specifications, and shall be of equal force in that no deviation will be permitted except with the approval of the Engineer.

1.9.2 If shop drawings show variation from the requirements of the Contract Documents, the Contractor shall make specific mention of such variation in his letter of transmittal. If acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract.

1.9.3 Review of shop drawings, descriptive literature, catalog data, or schedules by the Engineer shall not relieve the Contractor from responsibility for deviations from Contract Drawings or Specifications, unless he has in writing requested modification of the contract to permit such deviation and received written permission in the form of a Field Directive or Change Order prior to the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings, descriptive literature, catalog data, or schedules.

1.9.4 Submit shop drawings and any other drawings specifically called for in other sections. Shop drawings shall consist of plans, sections, elevations and details to scale (not smaller than 1/4" per foot), with dimensions clearly showing the installation. Direct copies of small scale project drawings issued to the Contractor are not acceptable. Drawings shall take into account equipment furnished under other Sections and shall show space allotted for it. Include construction details and materials.

1.9.5 Submit product data after award of the Contract and before any equipment or materials are purchased. Product data are defined as manufacturer's printed literature specifically marked to indicate size and model and accompanied by rating sheets listing values showing that equipment meets scheduled or specified values. Properly coded stamp from the Engineer on returned submittal is required before ordering equipment. Submit for all materials specified, shown on drawings or otherwise required or proposed for use.

1.10 Independent Testing Agency: Where testing by an independent testing agency is required or selected by the Contractor, the requirements below shall be met.

1.10.1 The testing firm shall be an independent testing organization which shall function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems evaluated by the testing firm.

1.10.2 The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.

1.10.3 The testing firm shall utilize technicians who are regularly employed by the firm for

testing services.

1.10.4 The testing firm shall submit proof of the above qualifications with bid documents.

2. PRODUCTS

2.1 All materials shall be new and unused, the best of their respective kinds, suitable for the conditions and duties imposed on them. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following Sections.

2.2 Equipment and Materials:

2.2.1 Equipment and materials furnished under this Division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar equipment or materials.

2.2.2 Each item of equipment shall bear a name plate showing the manufacturer's name, trade name, model number, serial number, ratings and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated or painted.

2.2.3 The label of the approving agency, such as UL or NEMA, by which a standard has been established for the particular item shall be in full view. Materials shall be UL-listed for the application specified or indicated on the Drawings or Specifications.

2.2.4 Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material and type of construction desired. Manufacturer's products shown on the Drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's products meet detailed specifications and that size and arrangement of equipment are suitable for installation.

2.2.5 Model Numbers: Catalog numbers and model numbers indicated in the Drawings and Specifications are used as a guide in the selection of the equipment and are only listed for the Contractor's convenience. The Contractor shall determine the actual model numbers for ordering equipment and materials in accordance with the written description of each item and with the intent of the Drawings and Specifications.

2.3 Requests for Substitution:

2.3.1 Where a particular system, product or material is specified by name, consider it as standard basis for bidding, and base proposal on the particular system, product or material specified. Other systems, products, equipment or materials may be accepted only if in the opinion of the Engineer, they are equivalent in quality and workmanship and will perform satisfactorily its intended purpose. All such substitutions in materials or equipment shall be approved in writing by the Engineer.

2.3.2 In making requests for substitutions, the Contractor shall list the particular system, product, equipment or material he wishes to substitute and at bid time the Contractor shall state the amount he will add or deduct from his base bid if the substitution is approved by the Engineer. If no deduction or addition to the base bid is allowed by the Contractor for such substitution, it shall be so stated on the request.

2.3.3 Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.

2.3.3.1 Required product cannot be supplied in time for compliance with Contract time requirements.

2.3.3.2 Required product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted or insured, or has other recognized disability as certified by Contractor.

2.3.3.3 Substantial cost advantage is offered Owner after deducting off-setting disadvantages including delays, additional compensation for redesign, investigation, evaluation and other necessary services and similar considerations.

2.3.4 All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate any and all differences or omissions between the product specified as the basis of design and the product proposed for substitution. Differences shall include but shall not be limited to data as follows for both the specified and substituted products:

Principle of operation.
Materials of construction or finishes.
Thickness of materials.
Weight of item.
Deleted features or items.
Added features or items.
Changes in other work caused by the substitution.
Performance and rating data.

If the approved substitution contains differences or omissions not specifically called to the attention of the Engineer, the Owner reserves the right to require equal or similar features to be added to the substituted products at the Contractor's expense.

3. EXECUTION

3.1 Workmanship: All materials, fixtures, and equipment shall be installed and completed in a first-class workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which do not present an orderly and reasonably neat and/or workmanlike appearance, or do not allow adequate space for maintenance, shall be removed and replaced when so directed by the Engineer.

3.2 Coordination:

3.2.1 The Contractor shall be responsible for full coordination of the electrical systems with shop drawings of the building construction so the proper openings and sleeves or supports etc., are provided for conduit, devices, or other equipment passing through slabs or walls.

3.2.2 Means of Support for all lighting fixtures, raceway, devices, or other items suspended from the ceiling (or otherwise from above) shall be fully coordinated with and in compliance with all requirements and recommendations of the manufacturer of equipment suspended.

3.2.3 Coordination with Other Divisions of this Contract shall be provided, prior to bid, as necessary to properly supply power to equipment in compliance with the UL Listings of this equipment. The division 16 design may provide a number of branch circuits, phases, ampacity, and overcurrent protection devices for design-basis equipment, provided by other divisions of this contract, conforming with the equipment manufacturer's specifications available at the time of design. Manufacturer's specifications available at the time of design often differ substantially from the specifications of the equipment actually provided under the contract for construction due to value engineering, due to the use of alternate approved equipment manufacturers, or due to periodic changes in the specifications of the equipment provided by other divisions of this contract. Prior to bid, Contractor shall coordinate with specifications, recommendations, and requirements of equipment to actually be provided under contract for construction. If requirements of equipment actually provided are different from electrical design, Contractor shall make all changes required without increase in contract amount or time schedule. Such changes may include – but shall not be limited to – changing the size, type, or quantity of conductors, conduits, circuit breakers, fuse protection, and disconnect switches. No changes in time schedule or contract amount shall be approved due to a failure to perform this required coordination.

3.2.4 It shall be the Contractor's responsibility to see that all equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the Drawings.

3.2.5 All connections to fixtures and equipment shown on the Drawings shall be considered diagrammatic unless otherwise indicated by a specific detail on the Drawings. The actual connections shall be made to fully suit the requirements of each case and adequately provide for servicing.

3.2.6 The Contractor shall protect equipment and fixtures at all times during storage and construction. He shall replace all equipment and fixtures which are damaged as a result of inadequate protection.

3.2.7 Prior to starting and during progress of work, examine work and materials installed by others as they apply to work in this division. Report conditions which will prevent satisfactory installation.

3.2.8 Start of work will be construed as acceptance of suitability of work of others.

3.3 Construction Electrical Utilities: Provide all temporary wiring for power and light required

for construction purposes and remove such temporary wiring when use is no longer required.

3.4 Interruption of Service: Before any equipment is shut down for disconnecting or tie-ins, arrangements shall be made with the Engineer and Owner and this work shall be done at the time best suited to the Owner. Outages must be scheduled through the Engineer. Extent, length, and timing of outages shall be reviewed by the Engineer. Services shall be restored the same day. Provide temporary power or other services as required during outages.

3.5 Cutting and Patching: Contractor shall be responsible for cutting and patching of all holes, chases, sleeves, and other openings required for installation of equipment furnished and installed under these Specifications. Obtain permission from Engineer before cutting any structural items.

3.6 Equipment Setting: Bolt equipment directly to concrete pads or foundations, using hot-dipped galvanized anchor bolts, nuts and washers. Level equipment.

3.7 Additional Steel Support Hardware required for the installation of any electrical or other equipment provided shall be provided by the Contractor. Contractor shall provide materials and labor necessary to ensure that all products are rigidly secured to structure pursuant to applicable portions of NEC 300-11. This shall include – but shall not be limited to – providing additional threaded rods, metal framing, and other hardware required to minimize horizontal as well as vertical movement. Means of support shall be clearly indicated and fully described in the submittal for items suspended. Threaded rods shall not be used as sole means of support for suspended raceway unless approved in writing by engineer or unless assembly can be demonstrated to be substantially free from significant horizontal or vertical sway or movement as is required to comply with NEC. Threaded rods shall not be used as means of support for lighting fixtures unless approved in writing by engineer.

3.8 Painting: Touch-up factory finishes on equipment located inside and outside shall be done under Division 16. Obtain matched color coatings from the manufacturer and apply as directed by manufacturer. If corrosion is found during inspection on the surface of any equipment, clean, prime, and paint, as required.

3.9 Clean-up: Thoroughly clean all exposed parts of apparatus and equipment of cement, plaster, and other materials and remove all oil and grease spots. Repaint or touch up as required to look like new. During progress of work, Contractor is to carefully clean and leave premises free from debris and in a safe condition.

3.10 Start-up and Operational Test: Start each item of equipment in strict accordance with the manufacturer's instructions; or where noted under equipment specification, start-up shall be done by a qualified representative of the manufacturer. Alignment, lubrication, safety, and operating control shall be included in start-up check.

3.11 Record Drawings:

3.11.1 During the progress of the work the Contractor shall record on their field set of Drawings

the corrections, variations, and deviations for systems which are not installed exactly as shown on the Contract Drawings.

3.11.2 Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 Sections.

3.12 Acceptance:

3.12.1 Request inspections as required under the Supplementary or General Conditions. Conceal no work until inspected.

3.12.2 Punch List: Submit written confirmation that all punch lists have been checked and the required work completed.

3.12.3 Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with the project, for a period deemed necessary by the Owner to instruct permanent operating personnel in the operation of equipment and control systems.

3.12.4 Operation and Maintenance Manuals: Furnish four complete manuals bound in ring binders and organized by system or section. Manuals shall contain:

3.12.4.1 Detailed operating instructions and instructions for making minor adjustments.

3.12.4.2 Complete wiring and control diagrams.

3.12.4.3 Routine maintenance operations.

3.12.4.4 Manufacturer's catalog data, service instructions, and parts lists for each piece of operating equipment.

3.12.5 Control Diagrams: Frame under glass and mount on equipment room wall.

3.12.6 Test together and separately to determine that:

3.12.6.1 System is free from short circuits and other faults.

3.12.6.2 Motor starter overload devices are sized correctly.

3.12.6.3 Motors rotate correctly.

3.12.6.4 All equipment operates correctly and as specified.

3.12.7 Warranties: Submit copies of all manufacturer's warranties.

3.12.8 Record Drawings: Submit "Record Drawings".

3.12.9 Install engraved metal or plastic nameplates or tags on controls, panels, switches, starters, timers, and similar operable equipment, keyed by number to operating instruc-

tions. Dymo type labels are not acceptable.

3.12.10 Acceptance will be on the basis of tests and inspections of the work. A representative of the firm which performed the testing shall be in attendance to assist during inspection. Contractor shall furnish necessary electricians to operate system, make any necessary adjustments and assist with final inspection.

END OF SECTION

## SECTION 16020/CODES AND STANDARDS

### 1. GENERAL

1.1 All work under Division 16 shall be constructed in accordance with the codes and standards listed herein. The design has been based on the requirements of these codes and standards. While it is not the responsibility of the Contractor to verify that all work called for complies with these codes and standards, he shall be responsible for calling to the Engineer's attention any details on the Drawings and/or Specifications that are not in conformance with these or other codes and standards. Current issue of code applies unless specifically noted otherwise.

1.2 Comply with regulations and codes of suppliers of utilities.

1.3 Where no specific method or form of construction is called for in the Contract Documents, the Contractor shall comply with code requirements when carrying out such work.

1.4 Where code conflict exists, generally the most stringent requirement applies.

1.5 Codes or standards applying to a specific part of the work may be included in that section.

### 2. CODES

2.1 Florida Building Code (FBC) 2001, As Revised 30 June 2003.

2.2 Florida Fire Prevention Code, 2001.

2.3 National Electrical Code (NFPA 70), 2002

2.4 National Electrical Safety Code (NESC)

2.5 Life Safety Code (NFPA 101), 2003

2.6 Standard for Emergency and Standby Power Systems (NFPA 110)

2.7 Physically Handicapped (ANSI A117.1)

2.8 Florida Accessibility Code for Building Construction (Chapter 11 of FBC)

### 3. STANDARDS

3.1 All electrical materials, installation and systems shall meet the requirements of the following standards, including the latest addenda and amendments:

3.1.1 American National Standard Institutes (ANSI)

3.1.2 Illuminating Engineering Society (IES).

3.1.3 Institute of Electrical and Electronics Engineers (IEEE).

3.1.4 National Electrical Manufacturer's Associations (NEMA).

3.1.5 National Fire Protection Association (NFPA).

3.1.6 Occupational Safety and Health Act (OSHA).

3.1.7 Underwriter's Laboratories, Inc. (UL).

3.1.8 State Requirements for Educational Facilities (SREF – Section 423 of FBC).

3.1.9 State of Florida Rules for Hospital Licensure, State of Florida Agency for Health Care Administration, Chapter 59A-3.

END OF SECTION

SECTION 16030/ELECTRICAL RELATED WORK

1. DIVISION 1 - GENERAL REQUIREMENTS

1.1 All Division 1 Sections apply to all Division 16 Sections.

1.2 Coordinate with the General Contractor for all cutting and patching. Contractors performing Division 16 work shall inform the General Contractor of all cutting and patching required prior to bidding and shall coordinate installation.

2. DIVISION 2 - SITEWORK

2.1 Specific requirements for excavation and backfill for underground conduit are contained in Section 16105.

2.2 The following is part of Division 16 work.

2.2.1 Underground electrical utilities.

3. DIVISION 3 - CONCRETE

3.1 Perform the following as part of Division 16 work, complying with the requirements of Division 3, Concrete.

3.1.1 Curbs, foundations and pads for electrical equipment.

3.1.2 Encasement of electrical work.

3.1.3 Underground structural concrete to accommodate electrical work.

3.1.4 Rough grouting in and around electrical work.

3.1.5 Patching concrete cut to accommodate electrical work.

4. DIVISION 4 - MASONRY

4.1 Refer to Division 4, Masonry for:

4.1.1 Patching openings to accommodate electrical work.

5. DIVISION 5 - METALS

5.1 Refer to Division 5, Metals for:

5.1.1 Supports for electrical work.

5.1.2 Framing openings for electrical equipment.

6. DIVISION 6 - WOOD

6.1 Refer to Division 6, Wood for:

6.1.1 Supports for electrical work.

6.1.2 Framing openings for electrical equipment.

7. DIVISION 7 - THERMAL & MOISTURE PROTECTION

7.1 Refer to Division 7, Thermal and Moisture Protection for:

7.1.1 Installation of all supports for electrical work.

7.1.2 Caulking and waterproofing of all wall and roof mounted electrical work.

7.2 Perform the following as part of Division 16 work, complying with Division 7 requirements.

7.2.1 Fire barrier penetration seals.

7.2.2 Caulking and related shielding around ducts and pipes for sound isolation and attenuation.

8. DIVISION 8 - DOORS AND WINDOWS

8.1 Refer to Division 8, Doors & Windows for:

8.1.1 Installation of all access doors for electrical work.

9. DIVISION 9 - FINISHES

9.1 Refer to Division 9, Finishes for:

9.1.1 Painting exposed conduit and equipment.

9.1.2 Painting structural metal and concrete for electrical work.

9.1.3 Painting access panels.

9.2 Colors shall be selected by the Architect for all painting of exposed electrical work unless specified herein.

9.3 Perform the following as part of Division 16 work.

9.3.1 Touch up painting of factory finishes.

10. DIVISION 15 - MECHANICAL

10.1 Mechanical Contractor shall furnish to Electrical Contractor all necessary nameplate

data, equipment power requirements, wiring diagrams, etc., pertaining to the electrical phase of mechanical installation, as well as all required motors, on/off switches, warning lights, relays, and control devices.

END OF SECTION

# SECTION 16034/REINFORCED CONCRETE FOUNDATIONS FOR ELECTRICAL EQUIPMENT

## 1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.

## 2. PRODUCTS

2.1 Concrete:

2.1.1 Concrete shall have a minimum 28-day compressive strength of 3,000 psi when cured and tested per ASTM C 31 and C 39.

2.1.2 Concrete shall be placed within 1-1/2 hours after adding cement.

2.1.3 Slump range shall be 2 to 4 inches and air entrainment between 3 percent and 6 percent by volume.

2.2 Reinforcing Steel:

2.2.1 Shall be deformed bars conforming to ASTM A 615, Grade 60 sized as shown on the Drawings.

2.2.2 Reinforcing steel shall be supported with concrete blocks of the same strength as the concrete mix. Use of broken concrete, brick or stone for supporting reinforcing steel shall not be permitted.

2.3 Expansion Joint Filler: Shall conform to ASTM D 994, 1/2-inch thick.

2.4 Nonshrink Grout:

2.4.1 Nonshrink grout shall conform to the Corps of Engineers Specification for Nonshrink Grout, CRD-C586-78.

2.4.2 Grout shall be fluid and shall be nonmetallic. Grout shall be nongas-liberating type, cement base, premixed product, requiring only the addition of water for the required consistency. All components shall be inorganic.

2.5 Forms: Use new plywood for exposed areas, and shiplap or plywood for unexposed areas. Materials shall produce tight forms and an acceptable finish.

2.6 Form Ties:

2.6.1 Form ties shall be constructed so the tie remains embedded in the wall, except for the removable portion at each end.

2.6.2 Form ties shall have conical or spherical type inserts. Inserts shall be fixed to remain in

contact with forming material, and shall be constructed so that no metal is within one inch of the concrete surface when forms, inserts, and tie ends are removed.

2.6.3 Wire ties shall not be used.

2.7 Anchor Bolts:

2.7.1 Unless otherwise indicated on the Drawings, anchor bolts shall have a minimum yield strength of 75,000 psi.

2.7.2 The thread area plus 6 inches of the bolts shall be hot-dip galvanized. In no case shall less than the top 18 inches of the bolt be galvanized. The remainder of the bolt shall not be galvanized, painted, or coated with oil.

3. EXECUTION

3.1 Forms:

3.1.1 Forms shall be constructed accurately with tight joints to prevent the escape of mortar and to avoid the formation of fins.

3.1.2 Brace forms to prevent distortion during concrete placement.

3.2 Placing Reinforcing Steel:

3.2.1 Reinforcing steel shall be placed in accordance with CRSI, Recommended Practice for Placing Reinforcing Bars.

3.2.2 Minimum length of splices shall be 18 inches. Splices shall be tied with 18-gauge annealed wire.

3.3 Placing Concrete:

3.3.1 Prior to placing concrete, remove water from excavation and all debris and foreign material from forms.

3.3.2 Before depositing new concrete on old concrete, clean surface and pour a 1-inch layer of cement sand grout over the surface of the old concrete.

3.3.3 Place concrete in 2 ft. layers without segregation or loss of ingredients and without splashing forms or steel above. Vertical drop to final placement shall not exceed 6 feet.

3.3.4 Do not place concrete when ambient temperature is below 40 degrees F or approaching 40 degrees F and dropping.

3.3.5 Compaction: Concrete shall be vibrated in place until it becomes uniformly plastic. Vibrators shall penetrate the fresh placed concrete and into the previous layer of concrete below.

3.4 Concrete Finishing:

3.4.1 Screed surfaces to true level planes. After absorption of initial water, float with wood float and trowel with steel trowel to a smooth finish.

3.4.2 Do not absorb wet spots with neat cement.

3.4.3 Foundation shall not vary from level more than 1/4 inch in 10 feet.

3.5 Removal of Forms: Forms shall not be removed until the concrete has set sufficiently to carry the dead load and construction load it has to sustain. Forms shall be removed with care to minimize scarring or other surface damage.

3.6 Finishing Formed Concrete Surface:

3.6.1 Cut out honeycombed and defective areas. Cut edges perpendicular to surface at least 1 inch deep, no featheredge shall be allowed. Soak area to be patched for 24 hours. Allow surface to drain free of standing water and patch with nonshrink grout.

3.6.2 When forms are removed, remove fins or projections from surface of exposed areas and rub surface with wood float to provide a uniform surface texture.

3.7 Concrete Protection and Curing: Protect fresh concrete from direct rays of the sun, drying winds, and wash by rain. When forms are removed and finishing completed, cure formed surfaces with curing compound applied in conformance with manufacturer's directions.

3.8 Concrete Quality Control: Contractor shall furnish certified test reports for the concrete used. Cost of taking, storing, and testing of sample cylinders shall be included in the bid price.

3.9 Concrete Testing:

3.9.1 Three representative cylinders of each batch of concrete shall be taken and tested as follows:

3.9.1.1 1 at 7 days

3.9.1.2 1 at 28 days

3.9.1.3 1 Spare

3.9.2 Test cylinders shall be taken at the site of the pour and shall be prepared and cured in a manner similar to the concrete work being done.

3.9.3 Cylinders shall be tested by an approved testing laboratory to verify the strength of the concrete.

3.10 Anchor Bolts:

3.10.1 Anchor bolts shall be set level, square, plumb, to the correct elevation, and properly spaced. Anchor bolts shall not be reinforcing bar.

3.10.2 After concrete is set, no force shall be applied to anchor bolts in an attempt to move them and correct their separation.

3.10.3 Boltholes on equipment base plates shall not be reamed or redrilled to fit an improper anchor bolt installation.

END OF SECTION

SECTION 16100/BASIC MATERIALS AND METHODS

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.

1.2 This Section is a Division-16 Basic Materials and Methods Section, and is part of each Division-16 Section making reference to or requiring products specified herein.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow. This shall include submittal for means of support of equipment, if necessary, as indicated below in this section.

2. PRODUCTS

2.1 Acceptable Producers: Allied Tube and Conduit; Anaconda Industries; Appleton Electric; Belden Corporation; W.H. Brady Co.; Carlon; Crouse-Hinds Co.; ETP; Elcen Metal Products Co.; General Cable Co.; General Electric Co.; Hoffman Engineering Co.; Harvey Hubbell, Inc.; Midland-Ross Corporation; Okonite Co.; 0-Z/Gedney; Raco, Inc.; Republic Steel Corporation; 3M; Southwire; Seton Nameplate; Square D Co.; Thomas and Betts; Triangle PWC, Inc.; Walker Parkersburg Textron; Wiremold Co.

2.2 As indicated, products listed herein may be common to various Division 16 Sections for this project.

2.3 All materials and equipment specified herein shall be UL listed or approved according to the requirements of applicable NEC articles.

2.4 Raceways:

2.4.1 Rigid Metal Conduit (NEC Art. 346) shall be galvanized steel, protected inside and outside.

2.4.2 Rigid Nonmetallic Conduit (NEC Art. 347) shall be polyvinyl chloride (PVC), schedule 40 or schedule 80, as indicated on the Drawings.

2.4.3 Electrical Metallic Tubing (EMT) (NEC Art. 348) shall be steel, protected inside and outside by a coating of approved corrosion-resistant material such as zinc or cadmium.

2.4.4 Flexible Metal Conduit (NEC Art. 350) shall be galvanized steel, protected inside and outside.

2.4.5 Liquid Tight Flexible Metal Conduit (NEC Art. 351) shall be galvanized steel, protected inside and outside with an extruded outer liquid tight, non-metallic, sunlight resistant jacket. Use with standard liquid tight fittings.

2.4.6 Surface Raceways (NEC Art. 352) shall be metal surface race-ways, two piece, snap on

cover type, rectangular, rust resistant undercoat and gray, buff or brown finish. Steel shall be minimum .040 inches.

2.4.7 Wireways (NEC Art. 362) shall be sheet metal troughs with hinged or removable covers, rust resistant undercoat and gray finish coat. Sizes shall be as indicated on the Drawings or determined by the Contractor based on NEC requirements according to the number of conductors enclosed. Exterior units shall be weatherproof. Steel shall be minimum 14 gauge.

2.4.8 Busways (NEC Art. 364) shall be of sheet metal enclosure components, ventilated or non-ventilated, indoor or outdoor type as indicated on the Drawings with copper bus, insulators or insulation jackets, and copper or brass bus fastenings. Sheet metal shall have rust resistant undercoat and factory standard color finish coat. Ampacity and bracing shall be as indicated on the Drawings. Provide full neutral bus and ground bus unless otherwise indicated on the Drawings.

2.5 Raceway Fittings:

2.5.1 Rigid Metal Conduit shall have threaded fittings, galvanized steel or threadless compression galvanized steel. Fittings shall be rain tight/concrete tight.

2.5.2 Rigid Non-Metallic Conduit shall have polyvinyl chloride (PVC) fittings suited for the purpose and joined together by a method approved for the purpose. Schedule 80 conduit sections may be joined together with threaded fitting connectors.

2.5.3 Electrical Metallic Tubing (EMT) fittings shall be compression type, all zinc plated steel; zinc plated steel body with cadmium plated malleable iron nut or cadmium plated malleable iron body and compression nut. Fittings shall be UL listed for rain tight, concrete tight or rain tight/concrete tight. EMT fittings for sizes 2" and larger may be zinc plated steel, set screw type unless otherwise indicated on the Drawings. Die cast or indenter type fittings shall not be permitted.

2.5.4 Flexible Metal Conduit fittings shall be zinc plated steel or cadmium plated malleable iron screw type with insulated throat and angular wedge fitting between convolutions of conduit.

2.5.5 Liquid-tight Flexible Metal Conduit fittings shall be cadmium plated, malleable iron or steel with compression type steel ferrule and neoprene gasket sealing rings, with insulated throat.

2.5.6 Surface Raceway fittings shall be steel with rust resistant undercoat and finish coat to match the surface raceway. The fittings shall be so designed that the sections can be electrically and mechanically coupled together without subjecting the conductors to abrasion.

2.5.7 Wireway fittings shall be steel with rust resistant undercoat and finish coat to match the wireway. The fittings shall be so designed that the sections can be electrically and mechanically fitted together to form a complete system. Dead ends shall be closed.

2.5.8 Expansion Fittings shall be corrosion protected steel for metal raceways, and PVC for non-metallic raceways. Provide bonding fittings for metal raceways and grounding conductors for PVC raceways.

2.5.9 Couplings and Unions shall be galvanized steel, tapered thread-standard conduit couplings for intermediate metal conduit and rigid metal conduit. PVC couplings for rigid non-metallic conduit shall use approved adhesive, and threaded couplings shall be used for schedule 80 conduit. Split couplings shall be galvanized steel. Unions shall be ground joint type galvanized steel.

2.6 Bushings:

2.6.1 Bushings shall be one of the following types:

2.6.1.1 Galvanized steel, threaded or threadless

2.6.1.2 Galvanized-plated steel, threaded or threadless, phenolic insulated with temperature rating of 150°C

2.6.1.3 Cadmium-plated malleable iron, threaded or threadless

2.6.1.4 Cadmium-plated malleable iron, threaded or threadless, phenolic insulated, with temperature rating of 150°C

2.6.1.5 Phenolic with temperature rating of 150°C

2.6.1.6 Zinc-plated steel, or cadmium plated malleable iron; threaded or threadless; non-insulated or insulated with grounding connector or grounding lug

2.6.2 Insulated bushings shall have phenolic insulation molded to the bushing

2.7 Conduit Seals: Conduit Seals shall be galvanized steel, tapered thread for intermediate metal conduit and rigid metal conduit with sealing compound and fiber.

2.8 Boxes: All boxes shall be 4" x 4" x 1½" deep or larger.

2.8.1 For indoor work, flush type junction, outlet and switch boxes shall be galvanized pressed steel.

2.8.2 Junction Boxes for exposed work shall be FS or FD type. Boxes shall be threaded, cadmium plated malleable iron with weatherproof galvanized or stainless steel cover and neoprene cover gaskets.

2.8.3 Boxes for exposed work in indoor finished spaces shall be FS or FD type, with the appropriate covers for the device and location. Surface type pressed steel boxes shall be used in nonfinished spaces only.

2.8.4 Fabricated Boxes shall be steel with inside and outside surfaces coated with corrosion-resistant paint or weather resistant coating. Covers shall be hinged or screwed with or without gaskets depending on location.

2.8.5 Floor Boxes shall be cast iron for watertight application, galvanized steel for standard application. Boxes shall be adjustable for both height and tilt and shall have a bronze hinged lid for receptacles and 2" hinged lid for telephone and sound outlets. Carpet rings shall be provided when carpet is to be installed.

2.9 Cabinets: Cabinets shall be flush or surface mounted as indicated on the Drawings, and fabricated of code gauge galvanized steel with turned lip on front. Cover shall be flat steel sheet with hinged door (concealed hinges) and flush catch and lock. All cabinets for the project shall be keyed alike. Cover shall be treated with rust-resistant undercoat and grey baked finish coat.

2.10 Low Voltage Conductors:

2.10.1 Conductors shall be 98% conductivity copper, medium or soft drawn. Sizes shall be as indicated on the Drawings. Sizes No. 10 and smaller may be solid unless noted on the drawings. Sizes No. 8 and larger shall be stranded. Insulation shall be THWN only except SI in switchgear.

2.10.2 Conductor Identification: Ungrounded conductors larger than No. 10 and grounded conductors larger than No. 6 may have factory colored insulation or black insulation with color coded identification tape.

2.10.3 Refer to the section "Conductor and Cable Identification" for color coding and identification of conductors.

2.10.4 Identification tags or labels shall be vinyl coated, with 1/8" minimum height, black characters on white background or stamped brass. Tag or label shall be ¼" wide minimum.

2.10.5 Wire Connectors for 600 volt conductors Size No. 18 to No. 6 AWG shall be pressure type, spring connectors. Use 600 volt splicer-reducer pressure connectors for copper conductors to 500 MCM. Use rectangular, solderless pressure connectors or split bolt copper alloy connectors for copper conductors to 1000 MCM.

2.10.6 Wire Pulling Lubricant shall be a product produced specifically for wire pulling lubrication.

2.11 Ground Rods: Ground rods shall be copper clad steel, ¾" diameter, 10' length minimum or as indicated on the Drawings. Use thermic welding to connect grounding conductor to ground rod.

2.12 Sleeves: Sleeves shall be hot dip galvanized metal flanged type or schedule 40 galvanized steel pipe.

2.13 Concrete Inserts: Concrete inserts shall be hot dip galvanized steel, minimum 14 gauge cut to necessary length for the purpose. Use galvanized hardware.

2.14 Metal Framing System:

2.14.1 Steel channel sections shall be rolled from commercial grade steel.

2.14.2 The cross-sectional width dimension of the channel shall be a minimum of 1½." The depth shall be sized to satisfy the load requirements and deflection.

2.14.3 Channels 1½" in depth or greater shall be rolled from 12 gauge steel. Channels smaller than 1½" in depth may be 14 gauge steel.

2.14.4 Attachment holes shall be factory punched on hole centers equal to the channel cross-sectional width dimension and shall be maximum of 9/16" diameter.

2.14.5 The finish on steel components shall be electro-galvanizing for use in dry locations indoor only, hot dip galvanized elsewhere.

2.14.6 Nuts, bolts, washers, straps, threaded rod and other parts shall be protected with the same finish as the channels.

2.15 Fire Barrier Penetration Seals:

2.15.1 Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for electrical components such as conduit or electrical boxes.

2.15.2 Cracks, voids, or holes up to 4" diameter shall be filled with putty, caulking, or one-piece intumescent elastomer which is non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat.

2.15.3 For openings 4" or greater use a sealing system capable of passing 3-hour fire test in accordance with ASTM E-814. Sealing system shall consist of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350°F.

2.16 Painting: Painting products are specified in Division 9 - "Finishes".

2.17 Equipment Identification: Provide nameplate for equipment identification sized as indicated on the Drawings. Nameplate shall be 3" x 1" minimum. Plates shall be laminated plastic (micarta) with white core. Mount plates with a minimum of two stainless steel screws, with round head or filister head. Normal power nameplates shall be Black. Emergency Power nameplates shall be Red.

2.18 Pull Wire and Pull Rope:

2.18.1 Pullwire shall be galvanized steel wire, No. 14 AWG minimum size.

2.18.2 Pullrope shall be ply cord with 2000 lbs. tensile strength, minimum.

2.19 Terminal Strips: Terminal strips shall be sectional barrier type made of molded phenolic for use in wiring control panels. Number of terminals and ampacity shall be as indicated on the Drawings. The binding head shall be screw in type.

2.20 Equipment Backboards: Equipment Backboards shall be exterior grade ¾" plywood finished on one side. Finish backboard with fire retardant gray paint before mounting.

3. EXECUTION

3.1 General:

3.1.1 Materials and equipment shall be installed in a neat and workmanlike manner according to the standards of the industry. Materials and equipment installed and not meeting the standards of the industry may be rejected and required to be removed and reinstalled by the Contractor at no additional cost to the Owner.

3.1.2 Contractor is responsible for the safety and conditions of the materials and equipment installed until Owner's beneficial occupancy or acceptance.

3.1.3 Minor location changes from those indicated may be necessary so that work can conform with the building as constructed, to fit work of other trades or to comply with the rules of authorities having jurisdiction.

3.2 Raceways:

3.2.1 Install wiring in metallic raceway systems including grounding, unless specifically indicated otherwise in other Sections herein or on the Drawings.

3.2.2 Refer to structural drawings for framed openings for raceways, etc., in floors and roofs. Contractor shall be responsible for locating and providing proper dimensions for all required electrical openings.

3.2.3 Layout and install raceways with sufficient clearance to permit proper installation.

3.2.4 Install raceways straight and plumb. Squarely cut conduit and properly ream to remove all constriction and burrs before making up joints. Paint exposed threads to retard rusting. Bending of conduit with a pipe tee or vise is prohibited.

3.2.5 EMT conduit shall be installed only in interior spaces. EMT shall not be installed in any slabs on or below grade; however, it is permitted in slabs suspended above grade such as in the floors higher than the ground floor in multistory construction. EMT installed in concrete shall have concrete tight fittings.

3.2.6 Maximum size of EMT shall be 4". Minimum size shall be ½" unless noted otherwise on the Drawings. EMT shall only be used with cables rated 600 volts or less.

3.2.7 Raceways in hazardous areas shall be rigid metal conduit.

3.2.8 Raceways below grade shall be rigid metal conduit or PVC unless noted otherwise. Raceways in concrete slabs-on-grade shall be rigid metal conduit or PVC unless noted otherwise. Raceways in slabs supported above grade (such as the floor slab of the second or higher story of construction) shall be rigid metal conduit or electrical metallic

tubing only unless noted otherwise. Raceways penetrating grade or concrete slab-on-grade shall be rigid metal conduit only (conduit and threads shall extend above finished grade or top of slab or contractor shall provide any materials and labor necessary to comply with this requirement); coordinate exact elevations with elevations indicated in contract documents for top of slab. Conduit penetrations of slabs supported above grade shall be rigid metal conduit or electrical metallic tubing only unless noted otherwise. If PVC is used, all elbows in any location and all risers through grade or slab shall be rigid metal conduit only. All rigid metal conduit provided below grade or inside slab-on-grade shall be protected by two coats of bitumastic to above finished grade or to above finished slab. PVC elbows shall not be permitted. PVC slab or grade penetrations shall not be permitted. All exposed conduit in wet or damp locations shall be rigid galvanized steel conduit only (no exception for painting). If not complied with, no additional compensation will be provided to the contractor for the correction of these or other contract requirements.

3.2.9 Rigid metal conduit installed in concrete or underground shall be made watertight by applying compound to the threads or using concrete-tight thread-less fittings when installed in concrete, or using rain-tight threadless fittings when installed on outside walls or in wet locations.

3.2.10 Rigid metal conduit installed underground or in slab-on-grade shall be painted with two coats of alkali and acid resistant paint such as bitumastic or equal. Coating shall not be diluted.

3.2.11 PVC coated rigid metal conduit may be provided as an option in lieu of the two coats of the alkali and acid resistant paint. The joints shall be protected with PVC tape applied after the joints are made. Tools for the purpose shall be used in making up the joints so as not to damage the coating.

3.2.12 Conduit may be exposed in equipment rooms, vertical chases, mechanical and electrical rooms, other similar spaces not normally habitable or exposed to public view, and where electrical drawings specifically note "exposed conduit."

3.2.13 Raceways shall be supported by approved types of galvanized wall brackets, ceiling trapeze with threaded rod support, or pipe straps. Conduit shall not be supported at any point by wire or wire clips.

3.2.14 Job cut threads shall be wire brushed, degreased and given two coats of cold galvanizing paint before assembly and a touch-up coat as necessary after assembly.

3.2.15 Conduit in masonry shall be installed ahead of the masons.

3.2.16 Cutting of chases is prohibited.

3.2.17 Conduit shall be closed during construction to prevent entrance of foreign material.

3.2.18 Flexible metal conduit shall be installed only in dry locations and shall be of nominal trade size not less than ½" or as permitted by "Exceptions" in NEC. Flexible metal conduit shall be used with UL approved type fittings. Flexible metal conduit shall be used as a

raceway for motors, transformers, or other equipment that may be provided with an adjustable mounting or vibration base.

3.2.19 Liquid-tight flexible metal conduit shall be installed in wet locations, in both concealed and exposed work, where required for protection from liquids, vapors or solids. Liquid-tight flexible metal conduit shall be used as a raceway for motors, transformers or other equipment that may be provided with an adjustable mounting or vibration base.

3.2.20 Surface raceway and fittings shall be installed in dry locations.

3.2.21 Wireways and wireway fittings shall be used for exposed work and when installed outdoors or in wet locations shall be approved weatherproof construction.

3.2.22 Expansion fittings shall be provided for raceways to compensate for thermal expansion and contraction and at building expansion joints. Bonding jumpers shall be provided for electrical continuity of the raceway system at the expansion fittings.

3.2.23 Bushings shall be provided at the end of a conduit to protect the insulation of the conductor. Provide grounding bushings for metal raceways, boxes, cabinets to insure that all metallic surfaces are effectively grounded. Metallic raceway may be bonded to cabinets, boxes and panelboards by double locknut and bushing to ensure the metallic parts are all effectively grounded.

3.2.24 Conduit or raceways through which moisture may enter and contact energized live parts shall be sealed or plugged at either or both ends with conduit seals where portions of an interior raceway system are exposed to widely different temperatures, e.g., circulation of air from a warmer to a cooler section through the raceway shall be prevented by conduit seals.

3.2.25 Install pull boxes in conduit at intervals of 200 feet or less except when these intervals will place the pull box cover in a finished floor area or non-accessible place, the interval may be extended to a maximum distance of 450 feet. Request for each deviation or extension of interval shall be made and approval granted by the Engineer before proceeding with the installation.

3.2.26 Underground Work:

3.2.26.1 Excavation and backfilling for underground conduit systems shall be in accordance with Division 2 "Sitework" and Division 16 Section on "Excavation and Backfill." Minimum cover for exterior underground conduit shall be 30" over conduit unless otherwise noted on the Drawings. Ductbanks, if installed, shall be provided as necessary to ensure drainage.

3.2.26.2 All underground piping and utilities shall have metalized warning tape installed above the pipe or line that identifies the specific system buried below. Tape shall consist of a minimum 3.5 mil solid foil core encased in a protective plastic jacket (total thickness 5.5 mils) and be 6" wide with black lettering imprinted on a color coded background that conforms to APWA color code specifications. Tape shall be continuously printed with "CAUTION" in large bold letters. A second printed line shall indicate the type of cable

beneath (i.e. 12 kV, 480 V, 208V, telephone, etc). Use yellow tape for electric and green for telephone. Tape shall be installed from 18" to 30" above the pipe and in no case less than 6" below grade.

3.2.27 Conduit Installed in Concrete:

3.2.27.1 Conform to applicable portion of Section 703 of ACI Standard Code for reinforced concrete.

3.2.27.2 Locate conduits in center third of concrete slab thickness. Outside conduit diameter not to exceed 1/3 concrete slab thickness. Install no conduit in concrete slabs of less than 3" thick.

3.2.27.3 Install no conduit in terrazzo flooring.

3.2.27.4 Conduits in concrete slabs shall not cross at an angle of less than 45 degrees.

3.2.27.5 Conduits shall not pass through beams except when shown on the Drawings.

3.2.27.6 Space vertical installation of conduit through concrete slabs not closer than three diameter on center.

3.2.28 Cleaning: Clean conduit systems by wire rat brush and mandrel.

3.3 Boxes:

3.3.1 Attach boxes to concrete formwork, or to other surrounding building material. Provide additional junction and pull boxes where injury to insulation or deformation of wire would occur due to excessive pulling resistance. When several feeders pass through a common pull box, tag each feeder separately, indicating electrical characteristics and destination.

3.3.1.1 Boxes shall be accurately located. Consult Architectural plans for dimensions.

3.3.1.2 Mount boxes in the course nearest to the height specified when installed in finished block, brick or tile walls.

3.3.2 Recessed Installation: Boxes and covers shall be installed so that the covers are flush with the finished surfaces. Boxes in masonry or tile construction shall have masonry boxes or boxes with square cut tile covers. Do not cut concrete block through its entirety in order to accommodate any type box. "Handy" boxes shall not be used.

3.3.3 Boxes in Partitions: Through type boxes are not permitted except where shown on electrical drawings. Recessed outlet boxes, cabinets, consoles, etc., when shown located back-to-back shall be provided with ½" fiberglass insulation between the boxes.

3.3.4 Lighting Outlets:

3.3.4.1 Coordinate location of electrical outlets with architectural features of the building and with

the equipment of other trades.

3.3.4.2 Paneled or patterned ceilings shall have outlets located according to the ceiling pattern.

3.3.4.3 Boxes mounted between bar joists or "T" bars shall be supported from two bars or joists.

3.3.4.4 Mounting heights of wall lighting outlets shall be as listed below except when otherwise indicated on the Drawings.

General - 7'6" above the finished floor.
Over lavatories - 6" to center above top of mirror.
Over doors - 18" to center above door.
Height may be adjusted to allow wall blocks to be cut to nearest edge.

3.4 Wiring:

3.4.1 General: Conductors shall not be installed until conduit system is complete. Bending radius of insulated wire or cable shall not be less than the minimum recommended by wire or cable manufacturer. Maximum pulling tension of any wire or cable shall not exceed manufacturer's recommended values. Do not injure insulation while installing wire in conduits.

3.4.2 Color Coding: Conductors of size No. 6 and smaller shall have color coded insulation. Sizes larger than No. 6 may have color coded insulation or color coded tape for the purpose. Should tape be used, cover not less than 2" of conductor within the enclosure.

3.4.3 Switchleg conductors shall be a color other than white, green or the phase or line color.

3.4.4 Green shall be used only as the grounding conductor. White or gray shall be used only as the grounded conductor which is the neutral conductor. The neutral shall not be used as the grounding conductor and the grounding conductor shall not be used as the neutral.

3.4.5 When more than one neutral is installed in a single raceway, the first neutral shall be identified with white color, and the second neutral shall be identified with gray color.

3.4.6 Intercommunications, communications, temperature control, and fire alarm conductors shall be color coded or permanently tagged for identity. If tagged, conductor colors shall not include white, gray or green base color or stripes. Colors shall comply with the Insulated Power Cable Engineers Association (IPCEA) method K-2.

3.4.7 Conductors in Parallel: Conductors connected in parallel (electrically joined at both ends to form a single conductor) shall be of the same length, of the same conductor material, the same circular-mil area, the same insulation type and terminate in the same manner. Where installed in separate raceways or cables, the raceways or cables shall have the same physical characteristics.

3.4.8 Wiring in motor control, switchboards, panelboards, junction cabinets, etc., shall be neatly formed to present a neat and orderly appearance.

3.4.9 A single neutral may be installed for three branch circuits provided each of the three is from a different phase. A single neutral may be installed for two circuits provided each is from a different phase.

3.4.10 The minimum size of wire shall be No. 12 AWG.

3.4.11 Interconnections of control wiring shall be on identified numbered terminal strips.

3.4.12 Splices: Splices shall be permitted in junction boxes, outlet boxes of other permanently accessible locations where permitted by applicable codes. Conductors No. 6 or smaller shall be spliced with devices approved by Underwriters Laboratories, Inc., as splicing connectors. Splices in conductors larger than No. 6 shall be accomplished with devices approved by Underwriters Laboratories as pressure cable connectors.

3.4.13 Splices made in underground boxes or wet locations shall be made with a commercial, UL approved cast resin splicing kit.

3.5 Wire Pulling Lubrication: Shall be used when any wire is pulled by mechanical means. Wire and cable shall be carefully handled during installation. Soap flakes or vegetable soaps shall not be used for lubrication.

3.6 Equipment Identification: Secure tags and markers to each item of equipment. Secure all cabinet nameplates with self-tapping screws or machine screws and nuts. Do not rely on adhesive mounting. Name tags for equipment operated from normal power shall be "Black." Name tags for equipment operated from emergency power shall be "Red."

3.7 Sleeves, Inserts and Supports:

3.7.1 Equipment Supports: Concrete bases and structural steel to support this Division's equipment and raceways, and not specifically shown on Structural or Architectural Drawings shall be furnished by Contractor whose equipment or raceways is to be supported. Provide a raised reinforced 4" concrete base for all floor supported equipment, or as indicated on the Drawings.

3.7.2 Setting in Concrete: Place all inserts in concrete forms prior to time concrete is poured. If additional inserts are required in existing concrete work, use self-drilling screw anchors.

3.7.3 Support Spacing: Comply with codes and regulations referenced earlier and as follows:

3.7.3.1 Support no electrical work from piping, ductwork, etc. Where metal decking is used, provide supports independent of decking so that loads will not be transferred to decking. Drill through decking and secure supports to concrete slab.

3.7.3.2 Vertical conduit inside building shall be supported at each floor level and at 10'0" intervals.

3.7.3.3 Support conduit within one foot of changes of direction, and within one foot of each enclosure to which it is connected.

3.7.4 Sleeves Through Roofs: Coordinate setting with Division 7. Contractor shall provide penetrations complying with Architectural requirements.

3.8 Additional Steel Support Hardware required for the installation of any electrical or other equipment or devices provided shall be provided by the Contractor. Contractor shall provide materials and labor necessary to ensure that all products are rigidly secured to structure pursuant to applicable portions of NEC 300-11. This shall include – but shall not be limited to – providing additional threaded rods, metal framing, and other hardware required to minimize horizontal as well as vertical movement. Means of support shall be clearly indicated and fully described in the submittal for items suspended. Threaded rods shall not be used as sole means of support for suspended raceway unless approved in writing by engineer or unless assembly can be demonstrated to be substantially free from significant horizontal or vertical sway or movement as is required to comply with NEC. Lighting fixtures shall not be supported by threaded rods or chains unless approved in writing by engineer. See Project Manual Section, "Lighting Fixture Supports, Standards and Poles."

3.9 Caulking and Seals:

3.9.1 Where conduits, wireways, and other electrical raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases in accordance with Division 7 requirements. Fire stop shall be UL listed and NFPA approved for such service. Completely fill and seal clearances between raceways and openings with the fire stop material. Adhere to manufacturer's installation instructions.

3.9.2 At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight.

3.10 Painting:

3.10.1 Painting for Division 16 work shall be by the Division 9 finishes contractor and as provided in Division 9 - finishes.

3.10.2 The Division 16 Contractor shall be responsible for coordinating with the Division 9 - Finishes Contractor the painting of the materials and equipment of Division 16.

3.10.3 Refer to the Finish Schedule on drawings for location and type of paint.

3.10.4 Finish in areas not listed or otherwise noted shall be black enamel.

3.10.5 Hangers, supports, structural steel and equipment that are not factory finished shall be prime coated and finished coated with color to match the area in which it will be located.

3.10.6 Electric cabinets, switchboards, panelboards and equipment that are factory finished and have damaged finish shall be touched up to match the factory finish.

3.10.7 All surfaces that are to be painted shall be free of rust, scale, oil and grease before prime

coat is applied.

3.11 Grounding: Ground and bond in accordance with NEC Article 250 and other applicable articles.

3.11.1 Provide an equipment grounding conductor which shall be separate from the electrical system neutral conductor. The equipment grounding conductor shall be colored green. It shall be continuous from a connection at the Service Entrance Equipment Ground to all switchboards, distribution and branch panelboards. Equipment grounding conductors shall be provided in all branch circuits serving convenience outlets, receptacles, portable and permanently installed electrical appliances, equipment apparatus and other miscellaneous metal enclosing bodies including light switch boxes normally within contact of personnel. Branch circuit grounding conductors shall be sized in accordance with the National Electrical Code. Connections at panelboards, outlets, equipment and apparatus shall be made in an approved and permanent manner. Resistance to ground shall not exceed 25 ohms.

3.11.2 Bond bushings of the raceway system to ground lugs in boxes, cabinets, motors and equipment to assure electrical continuity of all metallic components of the electrical systems. Comply with the requirements of NEC.

3.12 Equipment Backboards: Locate equipment backboards where indicated on the Drawings. Install straight and plumb. Secure to structure using screws, toggle bolts or masonry anchors. DO NOT use plastic or wood plugs in masonry or concrete. Do not install combustible backboards in air handling space, plenums or where prohibited by the local governing authority.

3.13 Underground Raceway Markings: Provide monument marker above the ends of any "Stub Out" raceway. See monument marker detail in these Specifications.

3.14 Testing:

3.14.1 At the completion of the installation of the conductors or cables into the raceway systems, tests shall be conducted by "megger" to ascertain that the insulation for the conductors or cables has not been damaged. Megger test each feeder and branch circuit conductor or cable with an instrument capable of producing approximately 500 volts for conductors or cables insulated with 600 volt insulation.

3.14.2 The minimum insulation resistance shall be 100 megohms per 1000 feet of 500 KCMIL conductors or smaller insulated with THW or THWN, and 1,000 megohms per 100 feet of 500 KCMIL conductors or smaller insulated with XHHW or other cross-linked insulation.

END OF SECTION

# SECTION 16101/CONDUCTOR AND CABLE IDENTIFICATION

## 1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.

1.2 This Section is a Division-16 Basic Materials and Methods Section, and is part of each Division-16 Section making reference to or requiring products specified herein.

1.3 This Section provides the requirements for identification of grounded conductors (neutral), grounding conductors, ungrounded conductors and terminals.

1.4 Grounded Conductor (neutral), Size No. 6 AWG or smaller, shall be identified by a continuous white or natural gray outer finish along its entire length. Sizes larger than No. 6 AWG shall be identified either by a continuous white or natural gray outer finish along its entire length or at the time of installation by a distinctive white or gray marking at its terminations.

1.5 A continuous white or natural gray covering on a conductor or a termination marking of white or natural gray color shall be used only for the grounded conductor (neutral).

1.6 Terminals to which a grounded conductor is to be connected shall be substantially white in color or identified by white markings. Other terminals shall be a different, readily distinguishable color, or by markings in different, readily distinguishable colors.

1.7 Grounding Conductor Size No. 6 AWG or smaller shall be identified by a continuous green outer finish along its entire length. Sizes larger than No. 6 AWG shall be identified either by a continuous green outer finish along its entire length or at the time of installation by a distinctive green marking at its termination.

1.8 Terminals to which grounding conductors are connected shall be green in color.

1.9 A continuous green covering on a conductor or a termination marking of green shall be used only for the grounding conductor.

1.10 Control wiring and data cables shall be identified by heat shrink sleeves at both ends hot stamped with wire numbers coordinated to wiring diagrams. Adhesively attached Brady tag type markers are specifically forbidden. All terminal boards shall be numbered.

## 2. PRODUCTS

2.1 Comply with the Section 16100, "Basic Materials and Methods."

## 3. EXECUTION

3.1 Identification of conductors shall follow the format set forth herein for the electrical characteristics as indicated:

3.1.1 120/240 Volt Single Phase 3 Wire

| | |
|---|---|
| Neutral | White or Gray |
| Line 1 | Black |
| Line 2 | Red |
| Grounding Conductor | Green |

3.1.2 120/208 Volt Three Phase 4 Wire WYE

| | |
|---|---|
| Neutral | White or Gray |
| Phase A | Black |
| Phase B | Red |
| Phase C | Blue |
| Grounding Conductor | Green |

3.1.3 230/240 Volt Three Phase 4 Wire Delta

| | |
|---|---|
| Neutral | White or Gray |
| Phase A | Black |
| Phase B | Orange (Hi-Leg) |
| Phase C | Blue |
| Grounding Conductor | Green |

3.1.4 277/480 Volt Three Phase 4 Wire WYE

| | |
|---|---|
| Neutral | White or Gray with Stripe (tracer) |
| Phase A | Brown |
| Phase B | Orange |
| Phase C | Yellow |
| Grounding Conductor | Green with Stripe (tracer) |

3.1.5 Where more than one nominal voltage system exists, provide 1/8" thick engraved phenolic white on black lettered sign on every branch circuit panelboard in the project, new or existing, in compliance with NEC 210-4.

3.2 Communication, temperature control and fire alarm conductors shall be color coded or permanently tagged for identification. The colors shall not include white, gray, or green base colors or stripes (tracers) unless these colors are used on grounded conductors or grounding conductors.

3.3 Colors shall comply with the Insulated Power Cable Engineers Association (IPCEA) Method K-2 chart.

3.4 For direct current (DC) systems, Black shall be negative and Red shall be positive.

3.5 A single color conductor other than white, gray or green may be used when the conductors are identified with number tags or numbered wire.

3.6 Identification shall be provided at terminations of the conductors and at junction boxes,

terminals or cabinets when multi conductors are installed at these locations.

3.7 Fire Alarm conductors shall conform with the color code specified in the specification section titled, "Fire Detection and Alarm System."

3.7.1 Tag or label each conductor with zone numbers at each end and in each junction or pull box in the raceway system. Example Zone 1, Zone 2 etc. Each conductor shall have in addition to the zone number a terminal number at each end.

END OF SECTION

SECTION 16102/PVC RACEWAYS

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section

1.2 This Section is a Division-16 Basic Materials and Methods Section, and is part of each Division-16 Section making reference to or requiring products specified herein.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1 PVC Conduit and Fittings: Conduit shall be made of polyvinylchloride, Schedule 40, pipe, conforming to ASTM D 1785. Fittings shall be Schedule 40, socket type, solvent weld, complying with ASTM C 2466. Joints shall be watertight. Threaded type fittings may be used only for Schedule 80 Conduit. Fittings for Schedule 80 conduit shall comply with ASTM D2464.

2.2 Bends and Penetrations: Bends and slab or grade-penetrations on PVC conduit runs shall rigid steel conduit. All rigid steel conduit provided below-grade or in slab-on-grade shall be fully coated with two coats of bitumastic to above grade or to above slab-on-grade.

3. EXECUTION

3.1 Installation: Install only below grade, in slabs on grade, or where specifically indicated on the drawings. Provide in compliance with manufacturer's instructions. Provide only in straight sections; provide only where concealed; no PVC bends or PVC slab or grade-penetrations shall be provided. All bends, stub-ups, and slab or grade-penetrations of PVC conduit runs shall be Rigid hot-dip-Galvanized Steel (RGS). All RGS conduit provided below-grade or in slab-on-grade shall be fully coated with two coats of bitumastic to above grade or to above slab-on-grade. At no change in the contract amount or time schedule, Contractor shall provide materials and labor necessary to comply with these requirements. For example, if bitumastic is applied to RGS slab penetrations such that the bitumastic level is not above the top of the slab, Contractor shall remove concrete, provide additional bitumastic until above top of slab, and replace concrete; no slab or grade shall contact any RGS not protected by bitumastic. No change in contract amount or time schedule shall be approved for correcting work which lacks compliance with these requirements. Place and join conduit, fittings and appurtenances as shown on the drawings and specified herein.

3.2 Jointing: Pipe and fittings shall be cement welded or threaded (only for Schedule 80 conduit) and made watertight. All joints shall be cleaned with solvent or sanded smooth prior to application of cement.

3.3 Supports: Support conduit in compliance with Table 352-30 of the National Electrical Code. Where conduit racks are used, do not bundle or lay conduit on top of each other. A minimum 1/8 inch spacing shall be maintained between parallel runs.

END OF SECTION

SECTION 16103/GENERAL GROUNDING ELECTRICAL SYSTEMS

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.

1.2 This Section is a Division-16 Basic Materials and Methods Section, and is part of each Division-16 Section making reference to or requiring products specified herein.

2. PRODUCTS

2.1 Ground rods shall be copperclad 3/4"x 10 feet.

2.2 Grounding conductors shall be copper with green insulation.

3. EXECUTION

3.1 Grounding Conductor Size No. 6 AWG or smaller shall be identified by a continuous green outer finish along its entire length. Sizes larger than No. 6 AWG shall be identified by either a continuous green outer finish along its entire length or at the time of installation by a distinctive green marking at its termination.

3.2 Provide an equipment grounding conductor which shall be separate from the electrical system neutral conductor. The equipment grounding conductor shall be colored green. It shall be continuous from a connection at the Service Entrance Equipment Ground to all switchboards, Motor Control Centers; distribution and branch panelboards. Equipment grounding conductors shall be provided in all branch circuits. Branch circuit grounding conductors shall be sized in accordance with the National Electric Code. Connections at panelboards, outlets, equipment apparatus shall be made in an approved and permanent manner. Electrical raceway shall not be used as a grounding conductor.

3.3 All ground connections shall be made on surfaces which have been cleaned of all paint, dirt, oil, etc., so that connections are bare metal to bare metal contact. All ground connections shall be tight, and shall be made with U.L. listed grounding devices fittings, bushings, etc.

3.4 Bond all metallic piping and structural systems to the service entrance ground bus with bonding jumpers the same size as the service grounding electrode conductor.

3.5 Grounding electrodes shall be driven as required. Where rock is encountered, grounding plates may be used in lieu of grounding rods.

3.6 All equipment enclosures, motor and transformer frames, conduits systems, cable armor, and similar items shall be grounded.

3.7 Exposed connections shall be made by means of approved grounding clamps. Exposed connections between different metals shall be sealed with No-Oxide Paint Grade A or approved equal. All buried connections shall be made by welding process equal to

Cadweld.

3.8 The Contractor shall exercise care to insure good continuous ground, in particular between the conduit system and equipment frames and enclosures. Where necessary, jumper wires shall be installed.

3.9 Provide a #6 ground conductor from each telephone terminal cabinet to the main telephone terminal board.

3.10 Multiple conductors in a single lug are not permitted. Each grounding conductor shall terminate in its own terminal lug.

3.11 Provide a ground conductor from each transformer location to the building ground system. This conductor shall be used to ground the secondary side neutral, case and core in accord with grounding requirements for a separately derived system.

3.12 Testing: The contractor shall test the ground resistance of the system. All test equipment shall be provided by the Contactor and approved by the Engineer. Dry season resistance of the system shall not exceed 5 ohms. If such resistance cannot be obtained with the system as shown, the Contractor shall provide additional grounding as directed by the Engineer without additional payment.

END OF SECTION

SECTION 16105/EXCAVATION AND BACKFILL

1. GENERAL

1.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.

1.2 This Section is a Division-16 Basic Materials and Methods Section, and is part of each Division-16 Section making reference to or requiring products specified herein.

2. PRODUCTS

2.1 Sand: Clean, hard, uncoated grains free from organic matter or other deleterious substances. Sand for backfill shall be of a grade equal to mortar sand, with 95% passing a No. 8 sieve, and not more than 8% passing a No. 100 sieve.

2.2 Gravel: Clean, well graded hard stone or limerock gravel, free from organic material. Size range to be from No. 4 screen retentions to 1".

2.3 Earth: Must be free of stones, wood, roots or rubbish.

2.4 Identification Tape: Polyethylene 0.004" thickness minimum, with metalized locator, 6" wide, yellow or green in color, black letters indicating service and voltage.

3. EXECUTION

3.1 Ditching and Excavation: Shall be performed by hand wherever the possibility exists of encountering obstacles or any existing utility lines. The Contractor will be totally responsible to insure that no utility or service interruptions shall be caused and that no existing utilities or obstructions will prohibit installations of service under this Contract at proper grade and location. Where clear and unobstructed areas are to be excavated, appropriate machine excavation methods may be employed. Avoid use of machine excavations within the limits of the building lines except when machine weights and operation will not damage sub-surface structural components or piping. Notify Engineer and Owner at once of any utility damage. Repair as directed to original condition to Owner's satisfaction at no change in the contract amount.

3.2 Bedding: Excavate to bottom grade of raceway to be installed, and shape bed of undisturbed earth to contour of conduit for a width of at least 5% of the conduit diameter. If earth conditions necessitate excavation below raceway grade, bring the bed up to the proper elevation with clean, dry sand deposited in 6" layers and firmly tamped by mechanical means. If sub-cut exceeds 12" or if bed is of an unstable nature, a 6" minimum layer of rock will be required before sand bedding begins.

3.3 Placing: Conduit shall be carefully handled into place in the excavation. Avoid knocking loose soil from the banks of the trench into the conduit bed. Coated conduit shall have special handling slings to prevent damage to the coating. All holidays in the conduit coating shall be touched in before beginning back filling.

3.4 Backfilling: Deposit earth or sand carefully in 6" layers, maintaining adequate side support. Compact fill in 6" layers, using mechanical means up to the top elevation of the conduit and 12" layers to finish grade.

3.5 Identification: Provide identifying metalized plastic warning tape above non-metallic conduit and standard plastic warning tape above metal conduit. Warning tape shall be placed approximately 12" above the conduit. Replace surface to the original condition, i.e., sodding, sprigging, fine grading.

3.6 Excavation shall be maintained in satisfactory condition during the progress of the work. Sub-surface structures shall be constructed in adequately sized excavations and dewatering equipment shall be installed and properly maintained. Shoring shall be employed in the event of unstable soil conditions, and in all cases to protect materials and personnel from injury.

END OF SECTION

SECTION 16106/MANHOLES AND HANDHOLES

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.

1.2 This Section is a Division-16 Basic Materials and Methods Section, and is part of each Division-16 Section making reference to or requiring products specified herein.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

1.4 All pullboxes and manholes shall be traffic rated.

2. PRODUCTS

2.1 Acceptable Producers: Brooks, Carlon, Hughes Prestressed, Neenah, Florida Precast, O-Z/Gedney, U.S. Foundry, A.C. Miller Concrete Products, Inc.

2.2 Concrete: Refer to the Division "Concrete". Minimum concrete strength shall be 3,000 pounds, in 28 days.

2.3 Reinforcing Steel and Wire Mesh: Refer to the Division "Concrete".

2.4 Manhole Covers and Fittings:

2.4.1 Manhole Covers and Frames: Shall be round, extra heavy duty cast frames and covers with words "Electric" or "Telephone" as appropriate, cast in the covers. Clear opening diameter shall be 44" with 33" pump ring or as shown on drawings. Manhole roof opening and masonry throat shall be 48" clear inside.

2.4.2 Miscellaneous Fittings: All cable racks, pulling eyes, supports and miscellaneous fittings shall be hot dipped galvanized. Provide a minimum of 3 racks on each wall.

2.5 Pullboxes: 2'x2'x2' minimum or as shown on plans. AASHTO-20 traffic-rated, concrete with cast-iron bolt down cover. Provide countersunk flush penta-head 1/2" stainless steel bolts.

2.6 Fastenings: Shall be manufactured of corrosion-resistant materials such as Type 18-8 stainless steel.

2.7 Location Identification: Pull boxes underground shall be identified with legend on cover and a monument marker shown in the Section "Basic Materials and Methods".

3. EXECUTION

3.1 General: Manhole shall be installed level and at a depth to provide a minimum of 12" of

earth above top of manhole. Lid shall be flush with finished grade.

3.2 Excess materials after backfilling shall be disposed by Contractor.

3.3 Cast-in-Place Manholes and Pull Boxes: Cast-in-place concrete type manholes or pull boxes shall be monolithic. Wood frames shall be used for both interior and exterior walls. Dowels shall be provided at all construction joints. Reinforcing steel and mesh shall be placed as required and supports shall be used to hold them in place until concrete is placed. Top of manholes shall be given a float finish and cover frames shall be grouted in. Install stubs, sump and ground rods as shown on the Drawings.

3.4 Pre-Fabricated Manholes and Pull Boxes: Other than cast in place type, manholes and pull boxes shall be located as shown on the drawings. Design of manholes or pull boxes shall include pulling eyes, cable or conductor racks, etc. Identify with a monument marker.

END OF SECTION

# SECTION 16107/SERVICE ENTRANCE MATERIALS AND METHODS - UNDERGROUND

## 1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

## 2. PRODUCTS

2.1 Acceptable Producers: Producers for this Section are specified in the "Basic Material and Methods".

2.2 Raceways: Raceways shall be rigid metal conduit, rigid non-metallic conduit and wireways as specified in the Division-16 Section "Basic Materials and Methods."

2.3 Conductors: Conductors shall be insulated copper as specified in the Division-16 Section "Basic Materials and Methods."

2.4 Ground Rods: Ground Rods shall be copper clad steel, 3/4" diameter, and a minimum of 10' long.

2.5 Service Disconnecting Means: Service disconnecting means shall be as specified in the Division-16 Sections "Disconnect Switches", "Switchboards" or "Panelboards."

2.6 Fuses: Fuses shall be as specified in the Division-16 Section "Fuses".

## 3. EXECUTION

3.1 Installation shall comply with the requirements of the Utilities Company and the applicable paragraphs in Article "3.0 EXECUTION" of the Division-16 Section "Basic Materials and Methods."

3.2 Comply with NEC 70 Article 230 - Underground Services.

3.3 Comply with the Division-16 Section "Excavation and Backfill."

3.4 Comply with the Division-16 Section "Manholes and Pull Boxes".

3.5 Provide concrete pads, conduit and metering conforming to utility company requirements and located as shown on the Drawings. Coordinate all work with Utilities Company.

3.6 Raceways shall be schedule 40 PVC or bitumastic coated rigid meatal conduit for straight lengths and bitumastic coated rigid metal conduit for any bends of 45 or 90

degrees.

3.7 All bends shall have a minimum radius of 36 inches.

3.8 Rigid metal conduit shall receive two undiluted coats of bitumastic free from holidays and pinholes.

3.9 The Electrical Contractor shall provide 3000 lb. test galvanized steel pull wire in each raceway except the raceway for the meter shall be 200-lb test polycord.

END OF SECTION

SECTION 16110/DISCONNECT SWITCHES

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1 Acceptable Producers: General Electric, Square D, Cutler-Hammer, Westinghouse, and Siemens ITE, or approved equal. Products shall be furnished by one provider.

2.2 General: Provide NEMA Heavy Duty type H.D., Underwriters Laboratories listed safety switches of voltage, amperes, and number of poles as indicated on the Drawings. Provide UL rated for service entrance use where indicated on the Drawings.

2.3 Mechanism: Switch operating mechanism shall be quick make, quick break. Switches shall have a dual interlock to prevent opening of door when switch is in "ON" position or closing of switch when door is in "OPEN" position.

2.4 Switch Interior: Interior of switch shall have fully visible switch blades in "OFF" position when door is open. Switches shall be dead front construction with permanently attached arc suppressors hinged or otherwise attached to permit easy access to line-side lugs, without removal of arc suppressor. Lugs shall be UL listed for copper conductors and shall be front removable. All current carrying parts shall be tin or silver plated by electrolytic processes. Provide ground lug in each switch for grounding conductor.

2.5 Enclosures: Use NEMA 3R enclosures for all exterior locations and interior locations in wet or humid areas except NEMA4 where indicated. Use NEMA 1 enclosures elsewhere, except as noted otherwise on the Drawings. Furnish NEMA 1 switches with knockouts. Enclosures for NEMA 1 switches shall be code gauge (UL 98) sheet steel with rust inhibiting phosphate treatment and baked enamel finish. NEMA 3R enclosures shall be of code gauge (UL 98) galvanized steel with rust inhibiting phosphate and baked enamel finish.

2.6 Ratings: Safety switches for motors shall be horsepower rated for AC or DC as specified on the Drawings. All fusible switches rated 100 thru 600 amperes at 240 volts, and 30 thru 600 amperes at 600 volts, shall have the capability of field conversion from standard Class H fuse spacing to Class J fuse spacing without affecting the UL listing. The switch also must accept Class R fuses and have field installable UL listed rejection feature to reject all fuses except Class R. UL listed short circuit ratings, when equipped with Class J or Class R fuses shall be 200,000 ampere RMS symmetrical. 800 and 1200 ampere switches shall have provisions for Class L fuses.

2.7 Fuses: Fuses shall be provided where indicated and sized as shown on the drawings. See Section "Fuses."

3. EXECUTION

3.1 Provide unfused or fused disconnect switch as indicated on the Drawings at each motor which is out of sight of its controller or 50 or more feet away from the controller.

3.2 Do not stack switches to touch each other, either horizontal or vertically. Allow space between enclosures.

3.3 Switch symbols on electric Drawings do not indicate exact switch locations. Locate switches adjacent to motor or equipment unless shown otherwise.

3.4 Clean and touch-up paint on disconnect switches damaged or scratched during installation.

END OF SECTION

SECTION 16112/FUSES 600 VOLTS AND BELOW

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1 Acceptable Producers: Bussman, General Electric, Gould & Brush Fuse.

2.2 General: Products listed herein are common to various Divisions and Specification Sections for this project and as shown on this project's Drawings.

2.3 All fuses furnished shall be by the same producer.

2.4 Voltage Rating:

2.4.1 Provide 600 volt fuses for 277/480 volt systems.

2.4.2 Provide 250 volt fuses for 120, 208 and 240 volt systems.

2.5 Ampere Ratings: Ampere ratings of fuses shall be as indicated on the Drawings.

2.6 Interrupting Ratings: Interrupting ratings of fuses shall be as indicated on the Drawings.

2.7 Current Limitation: Current limiting fuses shall be provided where indicated by the symbol C/L on the Drawings.

2.8 Rejection Fuse Clips: Provide fuse with rejection feature for switches required to have the rejection feature as indicated on the Drawings.

2.9 Class of Fuses: Provide fuses of Class J, K, L or R. Class H fuses shall be provided only if indicated on the Drawings.

3. EXECUTION

3.1 Coordinate fuse type and ampacity with fuse holder.

3.2 Provide one set of fuses of each type and ampacity for spares. Voltage to correspond with circuit to be protected.

END OF SECTION

SECTION 16120/CIRCUIT BREAKER ENCLOSURES

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1 Acceptable Producers: ABB, Cutler-Hammer, General Electric, Square D, and Siemens ITE or approved equal. Products shall be furnished by one producer.

2.2 General: Products listed herein may be common to various of the Divisions and Specification Sections of the project.

2.3 Enclosures shall be NEMA type with factory finish baked enamel or as indicated on drawings.

2.4 NEMA 1 enclosures shall be furnished with knockouts and fabricated of steel.

2.5 NEMA 3R enclosures, rainproof shall be furnished with raintight hubs sized for the conduit as shown on the Drawings. Enclosures shall be fabricated from zinc coated steel.

2.6 Provide enclosure with ground bus or terminal and fully insulated neutral bar or terminals.

2.7 Circuit breakers are specified in the Sections "Circuit Breakers, Molded Case."

3. EXECUTION

3.1 Individual circuit breaker enclosure shall be identified with an engraved laminated plastic legend plate.

3.2 Plastic (Dymo) type legend plates shall not be allowed.

3.3 Install a wireway for wiring between multiple units. Wireway fill shall not exceed 20% of cross sectional area.

3.4 Exterior units shall be in NEMA Type 3R raintight enclosure or as indicated on the Drawings.

END OF SECTION

SECTION 16125/CIRCUIT BREAKERS, MOLDED CASE

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1 Acceptable Producers: General Electric, Siemens/ITE, Cutler-Hammer, and Square D. Products shall be furnished by one producer.

2.2 General: Products listed herein may be common to various Divisions and Specification Sections.

2.3 Provide molded case circuit breakers with a minimum AIC rating of 10,000 amperes RMS symmetrical and with higher AIC ratings as indicated on the Drawings. Any circuit breaker provided in an existing panelboard or in an existing switchboard shall have minimum short circuit interrupting ratings (AIC) equal to the highest ratings of any of the existing overcurrent devices in the same panelboard or switchboard at the given voltage of the panelboard or switchboard. All circuit breakers shall be fully rated for the interrupting ratings indicated and shall not be series rated. Every overcurrent device provided shall be UL approved to individually interrupt its rated short circuit current and shall not depend upon operation of another overcurrent device to achieve its rating. Series-rated devices are not acceptable.

2.4 Individual circuit breakers shall be safety dead front units in NEMA Type enclosure.

2.5 Molded case circuit breakers shall have overcenter, trip free, toggle-type operating mechanisms with quick-make, quick-break action and positive handle indication. All breakers shall be bolt-on type.

2.6 Two and three pole circuit breakers shall have a common trip.

2.7 Each circuit breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole.

2.8 The circuit breaker shall be constructed to accommodate the supply connections at either end.

2.9 Circuit breakers provided shall be HACR-type as required by the manufacturers of the equipment supplied; see paragraph 3.1, below.

2.10 Circuit breaker operating handle shall assume a center position when tripped.

2.11 Circuit breakers shall be calibrated for operation in an ambient temperature of 40° C.

2.12 Provide molded case circuit breakers with shunt trip features where indicated on the Drawings.

3. EXECUTION

3.1 Contractor shall coordinate exact electrical requirements and circuit breaker types with that which is required by manufacturers of the equipment supplied – as necessary to maintain equipment's UL Listing; coordinate with other divisions of this contract. Contractor shall provide HACR-type circuit breakers as required by manufacturers of equipment supplied. See paragraph 3.2.3 of Section 16005 of the Project Manual.

3.2 Provide circuit breakers as specified in the Panelboard Schedules on the Drawings. Ampere ratings and the number of poles are indicated on the Panelboard Schedules.

3.3 Circuit breakers shall be suitable for mounting and operating in any position.

3.4 Circuit breakers shall be UL listed.

3.5 Shunt trip device where required shall operate in conjunction with contact closure of push button, ground fault relay or other pilot device to trip open associated circuit breakers upon command.

3.6 Coils of shunt trip device shall be rated continuous duty and shall include interlock arrangement to clear power from coil after operation.

3.7 Control Power: Where no other source of control power is indicated, energy to actuate tripping devices through action of pilot device shall be 120 volts, 60 Hz as follows:

3.7.1 120/208 Volt Panelboards: Energy shall be from dedicated branch circuit breaker of panelboard set to trip at not greater than 20 amperes.

3.7.2 277/480 Volt Panelboards: Energy shall be from control power transformer, with secondary voltage of 120 volts, 60 Hz and with primary leads protected by current limiting fuses mounted in plug-in style, dead front fuse block. Locate fuse block within panelboard and locate C.P.T. adjacent to panelboard in protected housing. Connect transformer primary at load side of circuit breaker to be tripped.

3.7.3 Switchboards: Energy shall be as specified above for 277/480 volt panelboards, except locate transformer accessibly within switchboard near fuse block.

3.7.4 Testing: Test all circuit breakers which are rated 200 amps or greater, both main and feeders, using standard tests to verify overcurrent and time delay settings and characteristics. Defective devices shall be replaced and the replacement device tested. All testing shall be performed by and independent electrical testing organization regularly involved in such work. Submit name of testing agency thirty days prior to test and advise

engineer of test time and date at least two weeks in advance. Submit four copies of test results, including device operating characteristics plotted on log-log time-current paper and operating and maintenance manuals.

END OF SECTION

SECTION 16150/CONTACTORS

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1 Acceptable Producers: Allen-Bradley, ABB, Siemens/ITE, Challenger, Westinghouse, General Electric Co., Square D.

2.2 General: See electrical Drawings, panelboard schedules and control diagrams for numbers and types of contactors required. Contactors shall be electrically held, unless indicated otherwise.

2.3 Enclosures: Contactors shall be mounted in NEMA type 1 enclosures.

2.4 Poles: Required by circuit controlled or as indicated on Drawings.

2.5 Ratings: Contactors shall be rated 100 Amperes minimum for inductive and resistive load.

2.6 Contactors: Shall be rated for operation at voltage indicated on Drawings.

3. EXECUTION

3.1 Mounting: For contactors outside panelboards, furnish contactors in enclosures and the enclosures shall be mounted on walls to slotted angles or channels with required hardware. Combustible materials for mounting are not permitted.

3.2 Controls: Install as indicated on Drawings.

3.2.1 System is free from short circuits and other faults.

3.2.2 All equipment operates correctly and as specified.

3.2.3 Grounded equipment shall have maximum of 25 OHMS resistance to ground.

END OF SECTION

SECTION 16155/RELAYS

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1 Acceptable Producers: Allen-Bradley, General Electric Co. and Square D.

2.2 General: See electrical Drawings, Panelboard Schedules and Control Diagrams for numbers and types of relays required. Relays shall be electrically held, unless indicated otherwise on the Drawings.

2.3 Enclosures: Relays may be mounted in panelboards or in NEMA type 1 enclosures adjacent to or above panelboard.

2.4 Poles: Required by circuit controlled or as indicated on Drawings.

2.5 Ratings: Rated for inductive and resistive load, or as indicated on Drawings.

3. EXECUTION

3.1 Mounting: For relays outside panelboards, furnish relays in enclosures. The enclosures shall be mounted on walls to slotted angles or channels with required hardware. Combustible materials for mounting are not permitted.

3.2 Controls: Install as indicated on Drawings.

END OF SECTION

SECTION 16160/TIME SWITCHES

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1 Acceptable Producers: Intermatic, Paragon, Tork, and M.H. Rhodes.

2.2 General: Drawings indicate units as flush mounted or surface mounted types as well as control switching functions. Surface mounted units shall be dead front type, NEMA 1 enclosures. Flush mounted units shall be manufactured for mounting into recessed metallic housings.

2.3 Time Clocks: Time clocks shall be 24 hour time control type with Skip-a-Day feature.

2.3.1 Momentary Contacts: Momentary contacts shall be provided with mechanically held contactors or relays with two N.0. contacts. Contacts shall withstand relay coil inrush current.

2.3.2 Contacts: Contacts other than momentary contact type shall be rated minimum 40 amperes per pole at 277 volts. Number of poles shall be as shown on the Drawings.

2.3.3 Timing Motors: Timing motors shall be heavy duty synchronous, self starting, high torque type with stored energy carry over for 10 hour operation during power outage.

2.3.4 Terminals: Terminals shall be screw type. Timing motor terminals shall be separate from switch circuit.

2.4 Timer:

2.4.1 Contacts: Timer contacts shall be rated 20 ampere 125 volt or 10 ampere 277 volt, S.P.S.T.

2.4.2 Time Cycle: Cycle shall be adjustable 0-6 hours, "OFF" type without hold.

2.4.3 Producer: M.H. Rhodes, Inc. Cat No. 90008.

3. EXECUTION

3.1 Mount time switches adjacent to or above contactors or circuits to be controlled as shown

on the Drawings.

3.2 Wire drive motors independently. Drive motor circuits shall be served at 120 volts from normal power source, unless otherwise noted on the Drawings.

END OF SECTION

# SECTION 16165/PHOTOCELL CONTROL

## 1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

## 2. PRODUCTS

2.1 Acceptable Producers: Intermatic, Paragon, Tork, and M.H. Rhodes.

2.2 General: Drawings indicate unit types required as well as control switching function.

2.3 Photocontrol: Shall be Paragon PJ 201-00 120 volt, 60 HZ, 2000 watt load rating or accepted equal.

## 3. EXECUTION

3.1 Mount photocontrol switches as indicated on the Drawings.

END OF SECTION

SECTION 16170/GENERAL WIRING DEVICES

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1 Acceptable Producers: Leviton, General Electric, Hubbell, Pass and Seymour, Sierra, Bryant, or Eagle Electric.

2.2 General: Devices shall be specification grade. Use ivory finished devices throughout except as hereinafter noted otherwise. See Electrical Drawings for gang switches, receptacles and notes for special wiring devices.

2.3 Switches:

2.3.1 Single Pole, 20 amp, 120/277V shall be Hubbell 1221 or approved equal.

2.3.2 Double Pole, 20 amp, 120/277V shall be Hubbell 1222 or approved equal.

2.3.3 Three-Way, 20 amp, 120/277V shall be Hubbell 1223 or approved equal.

2.3.4 Four-Way, 20 amp, 120/277V shall be Hubbell 1224 or approved equal.

2.3.5 Single Pole, 30 amp, 120/277V shall be Hubbell 3031 or approved equal.

2.3.6 Lock Type, same Hubbell catalog numbers above except add suffix "L". Furnish associated key with each lock type device.

2.3.7 Lighted Handle devices with handle lighted in "OFF" position shall be same catalog numbers as above or approved equals except suffixes shall be "IL" for 120V and "IL7" for 277V.

2.3.8 Lighted Handle, toggle type devices with handle lighted "ON" position shall be same catalog numbers as above or approved equals except suffixes shall be "PL" for 120V and "PL7" for 277V.

2.3.9 Narrow Wood or Metal Jambs and Partitions: Devices for installation in narrow wood or metal jambs and partitions shall be Pass and Seymour catalog numbers ACD201-I, ACD203-I or approved equal.

2.3.10 20 Ampere Interchangeable Switches: Provide pass and Seymour No. ACD201-I or approved equal, with identification engraved on cover plate. Engraving shall be 1/8" block letters, black enamel filled.

2.3.11 Pilot Light Switches: Provide switches with 120 volts pilot light as indicated on the Drawings. Mount switch and pilot light separately but in common cover plate. Pilot light shall be "ON" when switch is "ON".

2.3.12 Vaporproof and Weatherproof Switches: Provide standard tumbler switches in cast boxes with gasketed covers and operating handle. Switches shall be Pass and Seymour No. 4521 or approved equal.

2.4 Receptacles:

2.4.1 Catalog numbers indicated below are for Hubbell devices. Hubbell catalog numbers are used to give a standard for bidding purposes. However, approved equals will be accepted as indicated in other sections of these specifications.

Where indicated on the Drawings, the following suffixes shall be added to the Hubbell catalog numbers depending on the required color finish:

| | |
|---|---|
| I | Ivory |
| R | Red |
| GY | Grey |
| WHI | White |

No suffix indicates black or brown color finish. Add prefix IG to indicate isolated ground devices. Add prefix GF to indicate ground fault interrupting devices.

2.4.2 Single Receptacle Devices:

20 amp, 2 pole, 3 wire, 125V, NEMA 5-20R Hubbell #5361
30 amp, 2 pole, 3 wire, 125V, NEMA 5-30R Hubbell #9308
50 amp, 2 pole, 3 wire, 125V, NEMA 5-50R Hubbell #9360
20 amp, 2 pole, 3 wire, 250V, NEMA 6-20R Hubbell #5461
30 amp, 2 pole, 3 wire, 250V, NEMA 6-30R Hubbell #9330
50 amp, 2 pole, 3 wire, 250V, NEMA 6-50R Hubbell #9367
30 amp, 2 pole, 3 wire, 277V, NEMA 7-30R Hubbell #9315
50 amp, 2 pole, 3 wire, 277V, NEMA 7-50R Hubbell #9365
20 amp, 3 pole, 4 wire, 125/250V, NEMA 14-20R Hubbell #8410
30 amp, 3 pole, 4 wire, 125/250V, NEMA 14-30R Hubbell #9430
50 amp, 3 pole, 4 wire, 125/250V, NEMA 14-50R Hubbell #9450
60 amp, 3 pole, 4 wire, 125/250V, NEMA 14-60R Hubbell #9460
20 amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA 15-20R Hubbell #8420
30 amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA 15-30R Hubbell #8430
50 amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA 15-50R Hubbell #8450
60 amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA 15-60R Hubbell #8460

2.4.3 Duplex Receptacle Devices:

20 amp, 2 pole, 3 wire, 125V, NEMA 5-20R Hubbell #5362
20 amp, 2 pole, 3 wire, 250V, NEMA 6-20R Hubbell #5462
20 amp, 2 pole, 3 wire, 125V, NEMA 5-20R One boss, 250V, NEMA 6-20R second boss Hubbell #5492

2.4.4 Locking Type Devices:

20 amp, 2 pole, 3 wire, 125V, NEMA L5-20R Hubbell #2310
30 amp, 2 pole, 3 wire, 125V, NEMA L5-30R Hubbell #2610
20 amp, 2 pole, 3 wire, 250V, NEMA L6-20R Hubbell #2320
30 amp, 2 pole, 3 wire, 250V, NEMA L6-30R Hubbell #2620
20 amp, 2 pole, 3 wire, 277V, NEMA L7-20R Hubbell #2330
30 amp, 2 pole, 3 wire, 277V, NEMA L7-30R Hubbell #2630
20 amp, 2 pole, 3 wire, 480V, NEMA L8-20R Hubbell #2340
30 amp, 2 pole, 3 wire, 480V, NEMA L8-30R Hubbell #2640
20 amp, 3 pole, 4 wire, 125/250V, NEMA L14-20R Hubbell #2410
30 amp, 3 pole, 4 wire, 125/250V, NEMA L14-30R Hubbell #2710
20 amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA L15-20R Hubbell #2420
30 amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA L15-30R Hubbell #2720
20 amp, 3 pole, 4 wire, 480V, 3PH, No Neutral NEMA L16-20R Hubbell #2430
30 amp, 3 pole, 4 wire, 480V, 3PH, No Neutral NEMA L16-30R Hubbell #2730
20 amp, 4 pole, 5 wire, 120/208V, 3PH, NEMA L21-20R Hubbell #2510
30 amp, 4 pole, 5 wire, 120/208V, 3PH, NEMA L21-30R Hubbell #2810
20 amp, 4 pole, 5 wire, 277/480V, 3PH, NEMA L22-20R Hubbell #2520
30 amp, 4 pole, 5 wire, 277/480V, 3PH, NEMA L22-30R Hubbell #2820

2.4.5 Weatherproof receptacles shall be installed in flush weatherproof box with cast gasketed cover and self-closing spring door.

2.5 Miscellaneous Devices:

2.5.1 Pilot light shall be flush mounting, 7.5 watt, 125 volt unit with red jewel. Provide with stainless steel plate.

2.5.2 Clock outlets shall be single, 15 ampere, grounded 125 volt, with flush mounted stainless steel cover plate and clock hanger. Outlet shall be recessed for attachment plug.

2.5.3 Vaporproof or weatherproof pilot lights shall be flush mounted with bull's eye in gasketed cast cover.

2.6 Plates: Except as noted below, all wiring device plates shall be nylon or fiberglass reinforced with smooth ivory finish.

2.6.1 Exposed wiring devices shall be provided with galvanized steel plates with rounded corners.

2.6.2 Vaporproof and weatherproof devices shall be provided with cast covers with galvanized

or cadmium finish.

2.6.3 Floor outlet cover plates and raceways shall be satin bronze or chrome plated.

2.6.4 Boxes in which no devices are installed shall be equipped with blank plates.

3. EXECUTION

3.1 Outlet box heights shall be considered to be measured to the center-line of the box unless noted otherwise. Unless noted otherwise, light switches shall be provided at elevation of 47-1/2" above the finished floor or grade.

3.2 Determine door swings from architectural documents before installing room switch boxes. Install switches on latch side of door.

3.3 Contractor shall provide materials and labor necessary to ensure that each separate area has lighting switching sufficient to comply with minimum number of control points required by Florida Building Code 13-415.1.ABCD.1.1. This shall be a minimum of two switches per area (counting separate groups of multiple 3-way or 4-way switches as only one switch for each group instead of the actual number of switches) unless the area in question is one of the following: an area of continuous lighting for security purposes, a space in which only one lighting fixture or only one ballast is utilized, a space which must be used as a whole or which may only be occupied by one person due to its small size, or a dwelling unit or part of a dwelling unit. Contractor shall provide additional switches in each area until these requirements are satisfied (even if Drawings indicate a smaller number of switches) unless occupancy sensors or dimmers are shown in the space.

3.4 Provide ground wire (#12 AWG green) in each conduit in addition to phase and neutral wires. Ground wires shall interconnect equipment grounds, receptacle grounds, outlets and exposed equipment conductive surfaces with ground bars in panelboards.

3.5 Furnish template for receptacles, switches and other cutouts in casework to the Millwork supplier.

3.6 Mount switches at standard height (48" above finished floor) except where shown otherwise on Drawings. Where switches are located in tile wall finish, install them in tile, varying standard mounting height if necessary. Do not mount over 48" above finished floor unless so indicated on the Drawings.

3.7 Where several rows of lights are to be controlled, the switch nearest the door shall control the row nearest the interior wall, and the switch furthest from the door shall control the row furthest from the interior wall.

3.8 Receptacles Under Any Cooking Hoods shall be provided with all materials and labor necessary to automatically disconnect power to these receptacles upon activation of automatic fire suppression system if such hoods and suppression systems are utilized for this project; coordinate these exact requirements with the requirements of the manufacturers of any such division 15 hoods or suppression equipment utilized.

3.9 Switches that control remote outlets, fans, etc., shall have engraved plastic name tags indicating the outlets, fans, etc. that are controlled.

3.10 Receptacle Outlets: Mounting heights for receptacle outlets shall be 18" above finished floor or as indicated on the Drawings.

3.11 Miscellaneous Outlets:

3.11.1 Install clock outlets 96" above finished floor or as indicated on the Drawings.

3.11.2 Install outlets for equipment as required by the particular item. Verify that the plug provided with the equipment is compatible with the receptacle installed.

3.12 Wiring Devices and Plates: Wiring devices shall be rigidly installed properly aligned and plumb with wall and floor lines. A device plate shall be furnished for each device. Plates shall be installed with all four edges in continuous contact with the finish. Plates shall not support the wiring devices. Gaskets shall be installed where necessary to insure watertight and vapor tight construction.

END OF SECTION

SECTION 16171/GENERAL WIRING DEVICES (HOSPITALS GRADE)

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1 Acceptable Producers: Leviton, Hubbell, Pass and Seymour, Sierra, Bryant, or Eagle Electric.

2.2 General: Devices shall be hospital grade. See Drawings for gang switches, receptacles and notes for other special wiring devices.

2.3 Switches: All switches shall be 20 amp, 120/277V or 30 amp, 120/277V as shown on the Drawings.

2.3.1 Lock Type Devices where required shall be provided with the associated key.

2.3.2 20 Ampere Interchangeable Switches: Switches shall be hospital grade with identification engraved on cover plate. Engraving shall be 1/8" block letters, black enamel filled.

2.3.3 Pilot Light Switches: Provide switches with 120 volts pilot light as indicated on the Drawings. Mount switch and pilot light separately but in common cover plate. Pilot light to be "ON" when switch is "ON".

2.3.4 Vaporproof and Weatherproof Switches: Provide hospital grade switches in cast boxes with gasketed covers and operating handle.

2.4 Receptacles:

2.4.1 Catalog numbers indicated below are for Hubbell hospital grade receptacles. Hubbell catalog numbers are used to give Contractor a standard for bidding purposes. However, approved equals will be accepted as indicated in other Sections of these Specifications provided they are hospital grade devices. When indicated on the Drawings the following suffixes shall be added to the Hubbell catalog numbers depending on the required color finish:

| | |
|---|---|
| I | Ivory |
| R | Red |
| GY | Grey |

WHI White

No suffix indicates black or brown color finish. Add prefix IG to indicate isolated ground devices. Add prefix GF to indicate ground fault interrupting devices.

2.4.2 Single Receptacle Device: Provide 20 amp, 2 pole, 3 wire, 125V, NEMA 5-20R, Hubbell #8310.

2.4.3 Duplex receptacle device: Provide 20 amp, 2 pole, 3 wire, 125V, NEMA 5-20R, Hubbell #8300.

2.4.4 Locking type devices:

20 amp, 2 pole, 3 wire, 125V, Hubbell #23000 HG with associated wall plate (for non-hazardous areas).
20 amp, 2 pole, 3 wire, 125V, Hubbell #24353 with associated hardware (for Class 1, Division 1, Class C atmospheres)
50 amp, 2 pole, 3 wire, 250V, Hubbell #25505 (for Mobile x-ray plugs)
60 amp, 2 pole, 3 wire, 250V, Hubbell #25605 (for Mobile x-ray plugs)

2.5 Miscellaneous Devices:

2.5.1 Pilot lights shall be flush mounting, 7.5 watt, 125 volt unit with red jewel. Provide with 316 stainless steel plate.

2.5.2 Clock outlets shall be single 20 ampere, grounded 125 volt, flush mounted with 316 stainless steel cover plate and clock hanger. Outlet shall be recessed for attachment plug.

2.5.3 Vaporproof or weatherproof pilot lights shall be flush mounted with bull's eye in gasketed cast cover.

2.6 Plates: Except as noted below, all wiring device plates shall be hospital grade, 430 stainless steel with satin finish.

2.6.1 Exposed wiring devices shall be provided with 316 stainless steel plates with rounded corners except where special color finishes are required.

2.6.2 Boxes in which no devices are installed shall be equipped with blank 316 stainless steel plates.

3. EXECUTION

3.1 Outlet box heights shall be considered to be measured to the center-line of the box unless noted otherwise. Unless noted otherwise, light switches shall be provided at elevation of 47-1/2" above the finished floor or grade.

3.2 Determine door swings from architectural drawings before installing room switch boxes. Install switches on latch side of door.

3.3 Contractor shall provide materials and labor necessary to ensure that each separate area has lighting switching sufficient to comply with minimum number of control points required by Florida Building Code 13-415.1.ABCD.1.1. This shall be a minimum of two switches per area (counting separate groups of multiple 3-way or 4-way switches as only one switch for each group instead of the actual number of switches) unless the area in question is one of the following: an area of continuous lighting for security purposes, a space in which only one lighting fixture or only one ballast is utilized, a space which must be used as a whole or which may only be occupied by one person due to its small size, or a dwelling unit or part of a dwelling unit. Contractor shall provide additional switches in each area until these requirements are satisfied even if Drawings indicate a smaller number of switches unless occupancy sensors or dimmers are shown in the space.

3.4 Provide ground wire (#12 AWG green) in each conduit in addition to phase and neutral wires. Ground wires shall interconnect equipment grounds, receptacle grounds, outlets and exposed equipment conductive surfaces with ground bars in panelboards.

3.5 Furnish template for receptacles, switches and other cutouts in casework to the Millwork supplier.

3.6 Mount switches at standard height (48" above finished floor) except where shown otherwise on Drawings. Where switches are located in tile wall finish, install them in tile, varying standard mounting heights if necessary. Do not mount switches over 48" above finished floor unless so indicated on the Drawings.

3.7 Where several rows of lights are to be controlled, the switch nearest the door shall control the row nearest the interior wall, and the switch furthest from the door shall control the row furthest from the interior wall.

3.8 Receptacles Under Any Cooking Hoods shall be provided with all materials and labor necessary to automatically disconnect power to these receptacles upon activation of automatic fire suppression system if such hoods and suppression systems are utilized for this project; coordinate these exact requirements with the requirements of the manufacturers of any such division 15 hoods or suppression equipment utilized.

3.9 Switches that control remote outlets, fans, etc., shall have engraved plastic nametags indicating the outlet, fan, etc., that is controlled.

3.10 Receptacle Outlets: Mounting heights for receptacle outlets shall be 18" above finished floor or as indicated on the Drawings.

3.11 Miscellaneous Outlets:

3.11.1 Install clock outlets 96" above finished floor or as indicated on the Drawings.

3.11.2 Install outlets for equipment as required by the particular item. Verify that the plugs provided with the equipment is compatible with the receptacle installed.

3.12 Wiring Devices and Plates: Wiring devices shall be rigidly installed properly aligned and

plumb with wall and floor lines. A device plate shall be furnished for each device. Plates shall be installed with all four edges in continuous contact with the finish. Plates shall not support the wiring devices. Gaskets shall be installed where necessary to insure watertight and vapor tight construction.

3.13 Coordinate cover plate colors to correspond with the type of equipment and devices to be served such as emergency, life safety, life support, and equipment. Plate colors shall be as designated on the Drawings. Plates for other than normal lighting or outlets shall be labeled according to the system or equipment they serve. Labeling on plates shall be 1/4" letters etched, engraved or cast into the plate material.

3.14 Testing: After all wiring, switches and equipment are in place, carefully test together and separately to determine that:

System is free from short circuits and other faults.
All equipment operates correctly and as specified.

END OF SECTION

# SECTION 16200/EMERGENCY LIGHT AND POWER SYSTEM

## 1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

## 2. PRODUCTS

Not Applicable.

## 3. EXECUTION

3.1 System shall have two sources of power as follows:

3.1.1 Normal system.

3.1.2 Emergency system to be comprised of Generator set and equipment supplied by it.

3.2 Emergency circuit wiring shall be kept entirely independent of all other wiring and equipment and shall not enter the same raceway, cable, box or cabinet with other wiring except in transfer switches and in exit or emergency lighting fixtures supplied from two sources, or in a common junction box attached to exit or emergency lighting fixtures supplied from two sources.

END OF SECTION

# SECTION 16201/EMERGENCY POWER GENERATION - DIESEL ENGINE DRIVEN

## 1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals:

1.3.1 Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

1.3.2 Submit control diagrams indicating the interconnections for the Engine Control System and Accessory Equipment.

1.3.3 Submit the following data in tabulated form:

Make of engine
Number of cylinders
Bore, inches
Stroke, inches
Piston displacement, cubic inches
Piston speed, feet per minute at rated RPM
BMEP at rated KW output
Make and type of generator
Generator electrical rating. KVA or KW at .8 power factor
Number and type of bearings
Exciter type
Generator insulation class and temperature rise
Parts and service support
Engine manufacturer's certified engine BHP curve and certified generator set fuel consumption curve.

1.3.4 Submit a description of the engine-generator supplier's ability to provide service and parts.

1.3.5 Upon completion of engine-generator set installation, submit four (4) copies of operating and maintenance instructions and illustrated parts book for the unit installed.

1.4 Rating:

1.4.1 Ratings of the engine-generator set shall be as shown on the Drawings.

1.4.2 Engine-Generator set shall be classified – at the ratings indicated – as Type 10, Class X, Level 1 generator set pursuant to NFPA 110, *Standard for Emergency and Standby Power Systems.*

1.4.3 Rating of the diesel engine-generator set shall be based on operation of the set when equipped with all necessary operating accessories such as radiator, fan, air cleaners, lubricating oil pump, fuel transfer pump, fuel injector pump, jacket water pump, governor, charging alternator, alternating current generator, and exciter regulator.

1.4.4 The diesel engine-generator set shall be capable of producing energy at 0.8 power factor continuously for standby power applications, the electrical characteristics and schedule is specified hereinafter.

2. PRODUCTS

2.1 Acceptable Producers: Cummins/Onan, Caterpillar, Kohler, Generac and Detroit Diesel.

2.2 Engine Specifications:

2.2.1 Type: The engine shall be a compression ignition engine. It shall be a two or four stroke cycle, water cooled, direct-injection engine.

2.2.2 Horsepower: Certified engine horsepower curves shall be submitted showing the manufacturer's approval of the engine rating for generator set standby and prime power application. Special ratings or "maximum" ratings will not be acceptable.

2.2.3 Speed: The engine shall not exceed 1,800 RPM at normal full load operation.

2.2.4 Fuel: The engine shall be capable of satisfactory performance on a commercial grade of distilled petroleum fuel oil such as No. 2 diesel fuel. Engines requiring premium fuel will not be considered.

2.2.5 Governor: The governor shall be electronic isochronous type and shall maintain the generator frequency at any constant load, including no load, within plus or minus 0.25% of rated frequency. The governor shall not permit frequency modulation (defined as the number of times per second that the frequency varies from the average frequency in cyclic manner) to exceed one cycle per second.

2.2.6 Fuel System:

2.2.6.1 The fuel system shall include a replaceable element fuel filter conveniently located for servicing.

2.2.6.2 A ready supply "fuel tank" shall be mounted on or near the engine. Fuel tank shall have a minimum capacity to store fuel for 8 continuous hours of engine operation under full load.

2.2.6.3 Flexible fuel lines shall be furnished for each fuel connection to the engine.

2.2.7 Lubrication:

2.2.7.1 The engine shall have a gear-type lubricating oil pump for supplying oil under pressure

to main bearings, rod bearings, pistons, piston pins, timing gears, camshaft bearings, and valve rocker mechanism.

2.2.7.2 Threaded spin-on type full flow lubricating oil filters, conveniently located for servicing, shall be provided. Filters shall be equipped with a spring loaded bypass valve to insure oil circulation if filters are clogged.

2.2.8 Cylinder Liners: The engine shall be provided with removable wet type cylinder liners of close-grained alloy iron.

2.2.9 Air Cleaners: The engine shall be provided with one or more dry type, replaceable element, air cleaners.

2.2.10 Starting:

2.2.10.1 The engine shall be equipped with a 24 volt electric starting system of sufficient capacity to crank the engine at a speed which will allow full diesel starting of the engine.

2.2.10.2 Batteries: Shall be furnished having sufficient capacity for cranking the engine for at least 40 seconds at firing speed. A battery rack and necessary cables and clamps shall be provided.

2.2.11 Starting Aid: An engine mounted, thermostatically controlled immersion type engine coolant heater shall be provided to insure maintaining engine block coolant temperature in the range of 12°F to 14°F (50° - 60°C). The heater shall be 2500 watts minimum and suitable for operation on 120 volts, single phase AC power. It shall include a lube oil pressure switch for automatic cut-out on engine start.

2.2.12 Engine Instruments: An engine or generator mounted instrument panel shall contain the following gauges for proper engine surveillance and maintenance:

Engine Water Temperature
Engine Lube Oil Pressure
Engine RPM
Engine Lube Oil Temperature
Engine Running Hourmeter
DC System Volts
Generator AC Volts
Generator AC Amps
Generator Frequency

2.2.13 Cooling:

2.2.13.1 The engine shall be furnished with a cooling system having sufficient capacity for cooling the engine when the diesel generator set is delivering full-rated load.

2.2.13.2 The engine shall be equipped with an engine driven, centrifugal-type water circulating pump and thermostatic valve to maintain the engine at recommended temperature level.

2.2.13.3 The engine cooling system shall include one or more spin-on type engine water filters which will treat the coolant and prevent corrosion and scale deposits inside the cooling system.

2.2.13.4 Antifreeze: The engine cooling system shall be filled with a minimum concentration of 33% ethylene glycol.

2.2.14 Exhaust System:

2.2.14.1 Suitable silencer, of the residential type shall be furnished with the engine.

2.2.14.2 Silencer shall be mounted adjacent to the engine so it is at the same elevation or lower than the tallest part of the engine.

2.2.14.3 A flexible continuous, bellows type stainless steel interlocking joints exhaust pipe at least 24" long shall be furnished for each engine exhaust outlet. The pipe outlet connections shall be compatible with standard ASA-125 lb. pipe flange.

2.2.15 Safety Controls: The engine shall be equipped with automatic safety controls which will shut down the engine in the event of low lubricating oil pressure, high jacket water temperature, engine overspeed, engine overcrank, and make electrical contacts for alarm lights on the control panel. In addition, pre-alarm signals for high water temperature, and overspeed shall be provided.

2.2.16 Mounting:

2.2.16.1 The engine and generator shall be equipped with suitable full length sub-base for mounting the engine-generator unit on a concrete foundation.

2.2.16.2 Vibration isolation - The engine shall be equipped with spring type vibration isolators between the sub-base and the concrete foundation.

2.2.16.3 The vibration isolators shall be minimum of 90% efficient.

2.3 Generator Specifications:

2.3.1 Construction:

2.3.1.1 The generator shall be a brushless, revolving field type, coupled directly to the engine flywheel through a flexible driving disc for positive alignment. The generator housing shall bolt directly to the engine flywheel housing. The generator housing shall have a single ball bearing support for the rotor. The rotor shall be dynamically balanced up to 25% overspeed.

2.3.1.2 The generator shall comply with NEMA standard MGI-1975, Part 22. Insulation shall be class H or F as recognized by NEMA. The rotor and stator temperature rise for the class insulation being furnished, and as measured by the resistance method at the voltage, specified shall be in accordance with NEMA standard MG1-22.40 for standby operation. The generator shall be fully guarded per NEMA MG1.25.

2.3.1.3 The rotating brushless exciter shall incorporate a full wave, three phase rotating rectifier with hermetically sealed, metallic type, silicon diodes to supply main field excitation.

2.3.1.4 The rotor shall be layer wound with thermo-setting epoxy between each layer plus a final coat of epoxy. Amortisseur windings shall be integral with the rotor coil support. The rotor shaft bearing shall be shielded type with provisions for easy servicing through grease pipes which extend to the exterior of the generator frame. The bearing shall be designed for a minimum B-10 bearing life of 40,000 hours.

2.3.1.5 The stator winding shall be of 2/3 pitch design. The stator windings shall be given five dips and bakes of varnish plus a final coating of epoxy. Voltage harmonic distortion shall not exceed 5% total RMS measured line to line at rated load.

2.3.1.6 The generator shall be furnished with an end mounted, ventilated load connection box such that load conductors can enter the bottom of the junction box.

2.3.1.7 The voltage regulator shall be solid state construction with SCR control. It shall be mounted inside the generator terminal box or in the control cabinet. A built-in voltage adjusting rheostat shall provide 10% voltage adjustment.

2.3.2 Generator Set Performance:

2.3.2.1 The voltage regulation from no load to rated load shall be within a band of 1% of rated voltage. The steady state voltage stability shall remain within a 0.5% band of rated voltage. Steady state voltage modulation shall not exceed one cycle per second. The regulator printed circuit board and power control diodes shall be hermetically sealed. The voltage regulator shall be temperature stabilized to limit voltage change to 0.5% over a 40 degree celsius change.

2.3.2.2 For any addition of load up to and including 90% of rated load, at 0.8 power factor, the voltage dip shall not exceed 20% of rated voltage. The voltage shall recover and remain within the steady state band in not more than 5 seconds.

2.3.2.3 The frequency regulation from no load to rated load shall be in accordance with that defined by the engine governor performance. For any addition of load up to 90% of rated load, the frequency shall recover to the steady state frequency band within 7.0 seconds.

2.3.2.4 The voltage regulator shall be powered by a permanent magnet generator integral to the main generator but electrically isolated from it.

2.3.3 Current Boost: If a short circuit occurs, the generator shall be capable of supporting 300% rated current to 10 seconds for selective tripping of down line protection devices.

2.4 Control Equipment and Accessories:

2.4.1 Generator Control Panel: The generator control panel shall contain a voltmeter, ammeter, frequency meter, an ammeter and a voltmeter phase selector switch. The control panel shall be mounted in the Emergency Switchboard.

2.4.2 Alarm Annunciator System: A remote mounted annunciator panel (located as shown on the Drawings) shall be provided to give visual and audible indication of impending alarm conditions, engine failure conditions and monitor specific operational functions. It shall conform with the requirements of NEC Section 700-12 and NEPA 110. A local alarm panel shall be mounted with the Generator Control Panel in the Emergency Switchboard.

2.4.3 Automatic Start-Stop System: The engine starting panel shall automatically provide a minimum of four cranking and three rest periods. Operation shall be initiated by the closing of contacts in the automatic transfer switch. The automatic starting panel control switch shall include the positions of "Automatic," "Off", and "Test". The automatic starting panel shall contain 24 volt alarm lights energized by the safety controls noted in Section 2.2.1.6. A 24-volt visual light shall also be energized if the engine has not started by the end of the final cranking cycle. The panel and selector switch shall be mounted in the generator control panel.

2.4.4 Enclosure: When Drawings indicate standby generator will be located outdoors, the generator shall be provided in a NEMA 3R type enclosure unless otherwise indicated on the Drawings.

2.4.5 Battery Charger: Solid State type with automatic charge designed to maintain batteries at nominal full voltage. Provide "On-Off" switch with red pilot light (to show A.C. "On"), D.C. voltmeter and D.C. ammeter. Charger shall be designed so that high rate charge is automatically applied when batteries are discharged to excessive levels. As battery voltage increases automatically reduce rate and automatically return to float at end of eight (8) hours. Include integral fuse protection. Arrange charger so that A.C. power is always present, either from normal source or from standby source. Locate pilot light and meters on front of charger enclosure so that they are visible with door closed. Provide suitable weatherproof gaskets.

2.4.6 Block Heater: Provide manufacturers standard 120 volt water jacket heater with adjustable thermostat control.

3. EXECUTION

3.1 General: Install in accordance with producer's printed instructions. This shall include the exhaust line, ventilation, louvers (if required), and any ductwork that may be necessary for proper ventilation of the generator. Secure firmly to concrete pad. Insure vibration isolators are properly adjusted and operable.

3.2 Battery Charger: Provide materials and labor necessary to properly supply battery charger from normal or standby power from nearest panelboard or switchboard with sufficient available capacity.

3.2.1 Block Heater: Provide materials and labor necessary to properly supply block heater from normal power from nearest panelboard or switchboard with sufficient available capacity.

3.3 Control Wiring: Control wiring diagram shall be furnished by generator manufacturer.

3.4 Identification: Certify that all elements of emergency system (such as transfer switches, distribution centers, transformers and service switches) are plainly and visibly identified by appropriate nameplates as part of the emergency electrical system.

3.5 Testing:

3.5.1 All performance and temperature rise data submitted by the manufacturer shall be the test results of tests of the same generator being supplied. Temperature rise data shall be the result of full load, 0.8 power factor heat runs at the rated voltage and frequency specified. Testing shall be done in accordance with M1L-STD-705 and IEEE standard 115.

3.5.2 Before the equipment is installed, a factory test log of the generator set showing a minimum of 3/4 hour testing with 1/2 hour at 100% rated load at 0.8 power factor, continuously, shall be submitted for review. Voltage and frequency stability and transient response at 1/4, 1/2, and full load shall also be recorded.

3.5.3 Prior to acceptance of the installation, the equipment shall be subjected to an on site test at full load with reactive load banks for a minimum of 4 hours at .8 power factor. All consumables necessary for this test operation shall be furnished by the Contractor. Any defects which become evident during this test shall be corrected by the Contractor at his own expense.

3.5.4 Testing After all wiring, switches, and equipment are in place, carefully test together and separately to determine that:

3.5.4.1 System is free from short circuits and other faults.

3.5.4.2 All equipment operates correctly and as specified.

3.5.4.3 Test complete unit under load.

3.5.4.4 Mark all meters and gauges to indicate their normal reading or safe operation range, or permanently install nameplate adjacent to the gauges or on panel. Indicate generator output in amperes.

3.5.5 Startup: Employ services of factory trained service technician to inspect installation and connections, make required alignments and then witness start-up. Technician shall also instruct Owner's personnel in proper equipment adjustment and maintenance.

4. PARTS AND SERVICE

4.1 The engine-generator set contractor shall be the authorized dealer of the engine-generator set manufacturer, and shall be factory trained and authorized to provide service and parts for both the engine and generator at any time during the day or night. A description of the service and parts support capability shall be included with submittal information.

4.2 Maintenance: The contractor shall furnish four (4) copies of operating and maintenance

instructions and illustrated parts books covering the engine-generator and auxiliary equipment which will require operating instructions and periodic maintenance.

4.3 Warranty: The units offered under these specifications shall be covered by the manufacturer's standard warranty or guarantee on new equipment and shall be a minimum of one year from the date of acceptance and shall include 100% parts and labor coverage.

END OF SECTION

# SECTION 16207/AUTOMATIC TRANSFER SWITCH

## 1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals:

1.3.1 Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

1.3.2 Submit control diagram indicating the interconnections for Automatic Transfer Switch and the Emergency Power Generator Unit.

## 2. PRODUCTS

2.1 Acceptable Producers: Automatic Switch Co. (ASCO), Cummins Engine Co., Inc., Russelectric, Inc., Zenith, Westinghouse, Caterpillar, Kohler, Generac.

2.2 General: The automatic transfer switch shall consist of a power transfer module and a control module interconnected to provide complete automatic operation. The automatic transfer switch shall be mechanically held and electrically operated by a single solenoid mechanism energized from the source to which the load is to be transferred. The switch shall be rated for continuous duty and be inherently double throw. The switch shall be mechanically interlocked to ensure only one of two possible positions - normal or emergency.

2.3 All main contacts shall be of silver composition. They shall be protected by arcing contacts. Contacts shall be of the blow-on configuration and of segmented construction. The operating transfer time in either direction shall not exceed one-sixth (1/6) of a second.

2.4 All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.

2.5 The control module shall be supplied with a protective cover and be mounted separately from the transfer switch for ease of maintenance. Sensing and control logic shall be solid state and mounted on plug-in printed circuit boards. Printed circuit boards shall be keyed to prevent incorrect installation. Interfacing relays shall be industrial control grade plug-in type with dust covers.

2.6 Automatic transfer switches utilizing components of molded-case circuit breakers, contactors, or parts thereof which have not been intended for continuous duty or repetitive load transfer switching are not acceptable.

2.7 The automatic transfer switch shall conform to the requirements of NEMA Standard ICS-447 and Underwriters Laboratories UL-1008 and shall be UL listed as follows:

2.7.1 For use in emergency systems in accordance with Articles 517 and 700 of the National Electrical Code.

2.7.2 Rated in amperes for total system transfer including control of motors, electric discharge lamps, electric heating and tungsten filament lamp loads as referred to in Paragraph 30.9 of UL-1008.

2.7.3 Transfer switches rated 400 amperes and less shall be suitable for 100% tungsten filament lamp load. Switches rated above 400 amperes shall be suitable for 30% or 400 amperes tungsten filament lamp load, whichever is higher.

2.8 The automatic transfer switch shall be rated to withstand the RMS symmetrical short circuit available at the automatic transfer switch terminals with the type of overcurrent protection, voltage and X/R ratio as indicated on the Drawings.

2.9 The automatic transfer switch shall be provided in a NEMA enclosure or as otherwise indicated on the Drawings. Switch and accessory devices shall be with number of poles rated as indicated on the Drawings.

2.10 The complete automatic transfer switch shall be tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specified requirements.

2.11 The complete automatic transfer switch shall be subjected to a dielectric strength test per NEMA Standard ICS 1-109.05.

2.12 The control panel shall meet or exceed the voltage surge withstand capability in accordance with IEEE Standard 472 (ANSI C37.90a) and the impulse withstand voltage test in accordance with the proposed NEMA Standard ICS 1-109.

2.13 Operation:

2.13.1 For three pole switches for three phase service provide neutral conductor terminal lugs.

2.13.2 The automatic transfer switch control panel for three phase service shall utilize solid state sensing on normal and emergency sources for automatic, positive operation.

2.13.3 For three phase switches, the normal source voltage across all phases shall be monitored line-to-line. Close differential voltage sensing shall be provided. The pickup voltage shall be adjustable from 85% to 100% of nominal and the dropout voltage shall be adjustable from 75% to 98% of the pickup value. The transfer to emergency will be initiated upon the reduction of normal source to 85% of nominal voltage and retransfer to normal shall occur when normal source returns to 95% of nominal.

2.13.4 A time delay relay shall be provided to delay all transfer switch operation and engine starting signals during momentary normal source outages. The time delay duration shall be field adjustable from 0.5 to 6 seconds and factory set at 1 second.

2.13.5 A time delay shall be provided on retransfer to normal source. The time delay shall be automatically bypassed if the emergency source fails and normal source is available. The time delay shall be field adjustable from 0 to 30 minutes and factory set at 30 minutes.

2.13.6 An unloaded running time delay shall be provided for emergency generator cool-down. The time delay shall be field adjustable from 0 to 5 minutes and factory set at 5 minutes.

2.13.7 A time delay shall be provided on transfer to emergency. Initially set at zero but field adjustable up to 5 minutes for controlled timing of load transfer to emergency.

2.13.8 Provide independent single phase voltage and frequency sensing of the emergency source. The pickup voltage shall be adjustable from 85% to 100% of nominal. Pickup frequency shall be adjustable from 90% to 100% of nominal. Transfer to emergency shall occur upon normal source failure when emergency source voltage is 90% or more of nominal and frequency is 95% or more of nominal.

2.13.9 Provide a contact that closes when normal source fails for initiating engine starting. Contact shall be rated 10 amps 32 VDC.

2.13.10 Provide a contact that opens when normal source fails for initiating engine starting. Contact shall be rated 10 amps, 32 VDC.

2.13.11 A white signal light shall indicate when the automatic transfer switch is connected to the normal source. A yellow signal light shall indicate when the automatic transfer switch is connected to the emergency source.

2.13.12 An auxiliary contact shall be provided which will be closed when automatic transfer switch is connected to the normal source and another auxiliary contact shall be provided which will be closed when automatic transfer switch is connected to emergency source. Contacts shall be rated 10 amps, 480 volts, 60 Hz AC.

2.13.13 Provide a test switch to momentarily simulate normal source failure.

2.13.14 Harnessing between transfer switch and control panel shall have built-in disconnect for routine maintenance.

2.14 Operator's Manual: Each transfer switch shall be furnished with four (4) copies of an operator's manual providing installation and operating instructions.

3. EXECUTION

3.1 Automatic transfer switch shall be installed in location as shown on the Drawings.

3.2 Provide control wiring from ATS to generator control cabinet and starting circuit.

3.3 Provide all cable lugs not furnished by producer of transfer switch.

3.4 Testing: After all wiring, starters, switches and equipment are in place carefully test together and separately to determine that:

3.4.1 System is free form short circuits and other faults.

3.4.2 Motors rotate correctly.

3.4.3 All equipment operates correctly and as specified.

3.4.4 Test transfer switch under load for compliance with this Section of Specifications.

END OF SECTION

# SECTION 16410/LOW VOLTAGE SWITCHBOARDS, GROUP MOUNTED DEVICES

## 1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to this work.

1.2 Division-16 Basic Electrical Materials and Methods apply to work of this Section.

1.3 Scope: This section includes equipment, materials and labor necessary for complete service rated switchboard with group mounted distribution devices, including power study, setting and testing of circuit breakers.

1.4 Submittals: Submit to Architect complete manufacturer's shop drawings. Shop drawings shall include complete descriptive data on all circuit breakers (including curves), complete switchboard layout and busing arrangement, bus type and size, nameplate data, instrumentation and control wiring diagrams and diagrammatic and written description of other components. After installation, submit circuit breaker test results, coordination study including current-time coordination plots on log-log paper and tabulation of circuit breaker settings.

1.5 Spares: Furnish one set of spare fuses of each type and ampere rating used for control and instrument protection and 10 percent spare lamps. Furnish three of each crank, removable handle or any special tool necessary for operation or maintenance of switchboard.

## 2. PRODUCTS

2.1 General: Completely self-supporting, factory assembled, service-rated, front only accessible, isolated bus, low voltage switchboard with group mounted distribution circuit breakers, rated for operation at the 60 Hz voltage and currents indicated on the drawings. Units shall be complete with all framing, metal enclosures, isolating barriers, phase buses, neutral bus, ground bus, cable lugs, main circuit breaker, shunt trip, feeder circuit breakers, instrumentation, control power, and other necessary components. The entire assembly shall be designed, constructed and tested in accordance with applicable ANSI, NEMA, and UL standards, shall comply with NFPA-70 and shall bear the UL label.

2.2 Construction: Switchboards shall consist of vertical sections, 90 inches high, securely bolted together, lined up front and rear and not exceeding 45 (forty-five) inches in depth or 80 (eighty) inches in length. Enclosing panels shall be code gauge steel plates attached to frame with binding screws. Units shall be dead front design. Front covers over meters, switches, and other instrumentation shall be hinged along one side and screw fastened along the other with instruments attached directly to the cover and all wiring neatly laced and trained inside. Screws shall be captive type. All steel surfaces shall be chemically cleaned and treated to prevent corrosion. Switchboards shall have adequate means for lifting and shall be capable of being rolled into position and bolted to the floor.

2.3 Isolating Barriers: Provide steel or glass polyester isolating barriers between each

vertical section and around main buses. Barriers shall be easily removable and ready access shall be provided to all bolted bus connections. Isolation barriers shall be installed to effectively prevent contact with energized parts with front panels removed.

2.4 Buses: Solid copper, 98% conductivity. Electro-tin plated with maximum design current density of 1,000 amperes per square inch. Mounted on high impact, non-tracking material and braced to withstand fault currents indicated, but in no case less than 65,000 RMS symmetrical amperes. All spaces (including spaces for future circuit breakers) shall be fully bused and ready to accept circuit breakers without changes or additions to busing.

2.4.1 Main Bus: Shall be sized to carry the full load main current indicated on the drawings, but in no case shall be rated less than the frame size current rating of the main circuit protective device. Buses shall be arranged for uniform phase sequence from left-to-right (facing front of board) front-to-rear, and top-to-bottom. Bus shall be fully rated and shall not be tapered. Provide required number of cable lugs with spare lugs for future cables as indicated. Minimum rating of vertical buses shall be designed to safely carry the total current density imposed upon the bus on the basis of: (1) frame size ratings of all protective devices connected to the bus; plus (2) frame size rating of all spaces for future protective devices; plus (3) 25 percent additional capacity to that determined by (1) and (2) above; except that in no case shall vertical buses be permitted to be smaller than one-half the size of main horizontal buses. Vertical buses shall be of constant size (cross sectional area) from top to bottom of switchboards. Arrange circuit breakers and spaces so maximum current rating of bus is not exceeded at any point along bus.

2.4.2 Neutral Bus: Provide for full length of switchboards. Shall be 100% capacity of main horizontal phase buses. Electrically isolate neutral bus from the switchboard. Provide cable lugs for incoming and outgoing feeders with numbered points to match breakers. Provide spare incoming lugs and spare lugs for each future breaker space. Neutral bus shall have a removable section connecting to the ground bus. Removable section shall be accessible at the rear of the switchboard. Neutral bus shall be tied to the ground bus only at the removable section.

2.4.3 Ground Bus: Provide for full length of switchboard. Minimum size, ¼ inch x 4 inches, 98 percent conductivity, solid copper electro-tin plated. Electrically bonded to each section of the switchboard. Provide lugs as for neutral bus.

2.5 Cable Terminals: Front accessible only and suitable for copper conductors.

2.6 Service Connections: Provide necessary cable lugs at incoming sections. Provide lugs for incoming cables indicated plus spare lugs for future cables where indicated.

2.7 Instrumentation and Controls:

2.7.1 Meters: Provide ammeter, voltmeter, switches and watthour/demand meter at switchboard location as indicated on the drawings. Refer to Section titled "Electric Instrumentation".

2.7.2 C.T.s: Provide as required for metering and overcurrent protection.

2.7.3 Control Switches: Provide as necessary. Refer to Section titled "Electric Instrumentation".

2.7.4 Protective Devices and Relays: Provide as indicated or necessary.

2.8 Circuit Breakers:

2.8.1 Main Circuit Breaker shall be manually operated, service rated low voltage encased power circuit breaker as specified in Section titled "Low Voltage Encased Power Circuit Breakers". Provide ground fault protection conforming to requirements of NFPA-70.

2.8.2 Feeder Circuit Breakers shall be molded case circuit breakers as described in Section titled "Circuit Breakers, Molded Case".

2.9 Drawout Carriage: Provide for main circuit breaker. Drawout mechanism shall be of closed door design. Provide mechanical interlocks to prevent removing or inserting breaker in the closed position. Mechanism shall have means for cranking breaker in and out with indicated positions for "engaged", "test", and "disengaged".

2.10 Shunt Trip:

2.10.1 Provide factory-installed electromagnetically operated shunt trip as indicated. Devices shall operate in conjunction with contact closure of push button or other momentary or maintained contact device to open circuit breaker upon demand. Coil shall be rated for continuous duty and shall include interlock arrangement to clear power from coil after operation. Control power shall be 120 VAC 60 Hz. Provide pilot light illuminated by control power with label "SHUNT TRIP INOPERABLE WHEN LIGHT IS OFF - CORRECT AT ONCE".

2.11 Auxiliary Contacts: Provide N.O. and N.C. contacts as indicated or necessary for control and signal functions.

2.12 Control Wiring: All control wiring shall be type SIS #12 minimum stranded copper conductors with minimum 600 volt insulation. All wiring shall be numbered on both ends with hot-stamped plastic sleeves with numbers conforming to switchboard schematic wiring diagram. Adhesive number tags are unacceptable. Terminations shall be made using compression type lugs and screw type terminals either at devices or at terminal strips. Neatly lace and train all control wiring and secure to switchboard with appropriate straps.

2.13 Nameplates: Each compartment, breaker, instrument, switch, indicating light, and other devices shall be clearly labeled to indicate functional designation. Nameplates shall be ⅛-inch thick, 3-ply, white core, black faced, laminated phenolic blocks with engraved, ¼-inch high letters and shall be securely fastened to the front of the switchboard with countersunk, oval head cadmium plated or stainless steel screws. Nameplates at all feeder breakers shall include breaker designation as well as designation of load served (e.g.; "PANEL 1QA").

2.14 Acceptable Manufacturers: Switchboard, including all circuit breakers, shall be manufactured by General Electric Company, Square-D, Seimens-ITE, Asea-Brown-Boveri, Challenger/Westinghouse.

Acceptability of manufacturers listed above is based on reputation for quality and service and does not indicate that the manufacturer currently offers products that meet this specification. It is the contractor's responsibility to ensure that material provided meets this specification.

3. EXECUTION:

3.1 Installation:

3.1.1 General: Install switchboard in accordance with manufacturer's recommendations and instructions. Bolt all sections together. Bolt all bus joints necessary for field bolting using manufacturer's hardware and torqued to the recommended level. Switchboards shall be installed level and plumb on 4-inch high concrete pads. All wiring shall be installed neatly, and all power terminations shall be insulated with formed plastic covers.

3.1.2 Mechanical Operating Devices: One set of cranks, handles or special tools necessary for operation or maintenance of switchboard, circuit breakers or racking mechanisms shall be located on wall behind switchboards using suitable friction clips mounted on ¾ inch plywood backboard secured to wall. Paint backboard with two coats of fire retardant gray paint. Remaining two sets shall be delivered to owner.

3.1.3 Protection: Carefully protect switchboards from the elements after delivery to the site. Where switchboards are stored in areas subject to moisture (either precipitation or condensation) provide suitable electric heaters inside cubicles to reduce detrimental effects from such moisture. Any switchboard left unprotected in a manner which results in direct exposure to moisture may be rejected as unacceptable for installation at the project. Protect switchboard during construction to prevent concrete spatter or physical damage. Equipment will be required to be in "as-new" condition.

3.2 Coordination: Contractor shall provide a protective device coordination study and provide engineer with four (4) bound copies of the study showing recommended settings for all adjustable devices. Recommended settings shall achieve full short circuit and overload coordination with all upstream and downstream devices including utility transformer primary protection. study shall be performed by an agency regularly involved in such work and all copies shall be signed and sealed by a Florida Registered Professional Engineer. Report shall contain time current curves for all automatic overcurrent devices plotted on four cycle by five cycle log-log paper with all devices clearly identified. Contractor shall set all devices in accordance with report submitted and coordination of the devices shall be a warranty item under this contract.

3.3 Testing: Test all switchboard circuit breakers, both main and feeders, using standard tests to verify overcurrent and time delay settings and characteristics. Defective devices shall be replaced and the replacement device tested. All testing shall be performed by an independent electrical testing organization regularly involved in such work. Submit name of testing agency thirty days prior to test and advise engineer of test time and date

at least two weeks in advance. Submit four copies of test results, including device operating characteristics plotted on log-log time-current paper and operating and maintenance manuals.

END OF SECTION

SECTION 16412/ELECTRIC INSTRUMENTATION

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications Sections, apply to this work.

1.2 Division-16 Basic Electrical Materials and Methods apply to work of this section.

1.3 Scope: This Section includes requirements for electric instrumentation necessary to indicate voltage and amperage. Also included are requirements for indicator lights and control switches. Provide such instruments, indicators, and control switches where indicated on the drawings or where specified in other Sections of Division 16000 specifications.

1.4 Submittals: Submit manufacturer's data for all instruments, including necessary transformers, indicator lights, and control switches proposed for use.

1.4.1 Calibration: Each instrument shall be calibrated, after delivery to the job site, by an organization regularly engaged in the practice of such work. Submit four (4) copies of calibration report to Architect for each instrument and include copies of report instruction and Maintenance Manuals.

1.4.2 Tests: Demonstrate proper operation of all instruments to Architect.

2. PRODUCTS

2.1 Current Transformers: Provide as necessary for ammeter. Provide separate CT for each phase of system to be metered. CTs shall be designed for switchboard mounting except where specifically indicated otherwise. Select turns ratio to coordinate with size of system being metered. Properly label each CT to clearly show turns ratio on basis of primary winding to secondary winding currents. CTs shall have an accuracy classification for metering of "Class 0.3" as defined by ANSI C57.13 and shall be suitable for the imposed burden.

2.2 Meters:

2.2.1 General: Unless otherwise indicated, shall be semi-flush direct reading switchboard type with nominal four inch (4") face and seven inch (7") scale length. Accuracy shall be within 1% of full scale. Meter face shall be white with black markings and 250 degree scale arc. Provide external zero adjustment and selector switches for each meter. Taut band suspension type for voltmeter and ammeter.

2.2.2 Voltmeter: Provide seven (7) position selector switch to meter voltage from each line to neutral, each line to line, plus off position. Full scale of meter shall be zero to 600 volts.

2.2.3 Ammeter: Provide four (4) position selector switch to meter current in each line plus off position. Switches shall be shorting type. Properly label switch positions and calibrate. Full scale of meters shall be zero to 3000 amperes.

2.3 Control Power: Provide as necessary for electrically operated circuit breakers. Control power shall be derived from switchboard. Control voltage shall be 120 volt, 60 Hz.

2.4 Control Switches: Heavy duty, rotary cam-operated type with silver plated contacts rated 20 amps, 600V, and equipped with position indicators. Include an off position for instrument switches. Pistol grip handle.

2.5 Fusing: Provide fusing in voltage leads of all direct connected voltmeters. Fuses shall be current limiting type mounted on plug-in style, dead front fuse blocks located accessibly in the same compartment with device being protected.

2.6 Labels: Provide one-eighth inch (1/8") thick, 3-ply, white core, black face, laminated phenolic blocks with engraved, one-quarter inch (1/4") high letters identifying all instrumentation. Secure to panel fronts using countersunk oval head, cadmium plated, or stainless steel screws.

3. EXECUTION

3.1 All instrumentation shall be factory installed and wired by manufacturer of equipment on which instrumentation is located. Calibrate after equipment installation, submit test report and demonstrate proper operation to Architect.

END OF SECTION

SECTION 16420/PANELBOARDS

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

1.4 Depth Coordination: Provide panelboards with depths coordinated with wall thicknesses in locations shown on electrical drawings. Refer to architectural drawings for all dimensions. Include cost of any accommodations for dimensions of proposed panelboards in bid; no adjustments will be made in contract amount for lack of coordination.

2. PRODUCTS

2.1 Acceptable Producers: General Electric Co., ABB, Siemens/ITE, Cutler-Hammer, and Square D. Products shall be furnished by one producer.

2.2 General: Panelboards shall be UL listed, bolt-in circuit breaker type, with copper bus and door-in-door covers for all NEMA 1 enclosures. Door-in-door enclosure shall not require the use of any tools or the removal of any screws or other attachment hardware in order to access wiring compartment; only a separate key shall be required for this access. Piano-Hinge type enclosures are not suitable for this requirement. Door-in-door covers are not required for enclosure types other than NEMA 1. See panel schedules on Drawings for electrical characteristics.

2.3 Bus Assembly and Temperature Rise: Panelboard bus structure and main lugs or main breaker shall have current ratings as shown on the panelboard schedule. Ratings shall be established by heat rise tests in accordance with Underwriters Laboratories Standard UL 67. Provide copper bus assembly and copper only lugs for copper conductors. Bus bars shall be copper.

2.4 Circuit Breakers: Circuit breakers shall be full module, bolt-on type, equipped with individually insulated, braced and protected connectors. The front faces of all circuit breakers shall be flush with each other. Large permanent, individual circuit numbers shall be affixed adjacent to each breaker in a uniform position. Trip indication shall be clearly shown by the breaker handle. Provisions for additional breakers shall be such that no additional connectors will be required to add circuit breakers.

2.5 Provide shunt trip feature when indicated on the Drawings.

2.6 Equipment Short Circuit Rating: Each panelboard, as a complete unit, shall have a short circuit current rating equal to or greater than the equipment rating shown on the

panelboard schedule on the Drawings, but under no circumstances less than 10,000 amperes. Panelboard and circuit breakers shall be fully rated for interrupting ratings indicated. Under no circumstances will series rated equipment be acceptable. Every overcurrent device provided shall be UL approved to individually interrupt its rated short circuit current and shall not depend upon operation of another overcurrent device to achieve its rating.

2.7 Grounding Terminals: Provide each panelboard unit with a ground terminal bar and with lugs for equipment ground wires. Ampacity shall be the same as the full capacity of the main bus. Ground bar or lugs shall be copper.

2.8 Neutral Terminals: Provide each panelboard unit with an insulated neutral terminal bar. Ampacity of neutral bar shall be the same as the full capacity of the main bus bars. Neutral bar shall be copper.

2.9 Cabinet: Panelboard assembly shall be enclosed in a galvanized steel cabinet. The rigidity and gauge of steel shall be as specified in UL Standard 50 for cabinets. The size of wiring gutters shall be in accordance with UL Standard 67. Cabinet fronts shall be door in door type. Cabinets shall be equipped with latch and tumbler lock on door. Doors over 48" high shall be equipped with three point latch and vault lock. All locks shall be keyed alike. Minimum depth of cabinets shall be 5-3/4" and minimum width shall be 20". Cabinet shall not have ventilating openings.

2.10 Safety Barriers: The panelboard interior assembly shall be dead front with panelboard front removed. Main lugs or main breakers shall be barriered.

2.11 UL Listing: Panelboards shall be listed by Underwriters Laboratories and shall bear the UL label. When indicated, panelboards shall be suitable for use as service equipment.

2.12 Nameplates: Provide an engraved laminated phenolic identification plate 1" high by 3" wide with minimum 1/4" letters indicating the panelboard identification shown on the drawings. Nameplate shall be affixed to the exterior of the panelboard, visible with door closed.

In addition, panelboard shall bear a nameplate showing Manufacturer, Voltage, Ampacity, Type of Panelboard, Manufacturer's Order No. and Date, Interrupting Rating - RMS Sym.

2.13 Ground Fault Protection: Provide ground fault protection as indicated on the Drawings. Ground fault protection provisions shall comply with NEC Article 230-95.

3. EXECUTION

3.1 Provide circuit breakers with I.C. Ratings, amperes and number of poles as specified in the schedules on the Drawings.

3.2 Circuit breakers shall be UL listed.

3.3 Shunt trip device shall operate with the contact closure of pushbutton, ground fault relay

or other pilot device to trip open associated circuit breakers upon command.

3.4 Coils of shunt trip device shall be rated continuous duty and shall include interlock arrangement to clear power from coil after operation.

3.5 Mount adjacent panelboards so that they are aligned and do not touch each other.

3.6 Provide a typewritten circuit directory with a protective covering in a frame inside the door. Show load type (REC, LTG, AHU-1, etc.) and room number(s) served for every branch circuit breaker and panelboard served for every feeder circuit breaker.

3.7 Mount panelboards so maximum height of circuit breakers above finished floor does not exceed 78 inches.

3.8 Wiring Gutters: Feeder and Branch circuit conductors are sized for circuit ampacity and anticipated voltage drop and may be larger than the allowable ampacities in Table 310-16 of the NEC. Contractor shall provide cabinets with gutters sized to accommodate the conductors and connections actually being installed complying with Article 373-6 and Article 310-4.

END OF SECTION

SECTION 16450/TRANSFORMERS - DRY TYPE

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1 Acceptable Producers: Acme, Hevi-Duty, General Electric, Square D, Cutler-Hammer.

2.2 General: Conform to following requirements for all units. See electrical drawings for transformer ratings and locations.

2.2.1 Transformers shall be premium, natural draft, dry type constructed in accordance with the standards of ANSI, UL & NEMA. All windings shall be copper only. Aluminum is not permitted.

2.2.2 Transformers shall be provided with a universal tap arrangement, 2-1/2% above and 2-1/2% below normal primary voltage. Provide transformers with a minimum of 4 taps.

2.2.3 Enclosure: Transformer enclosure shall be steel with chromatic primer and baked enamel finish in producer's standard color. Provide insect and rodent screens.

2.2.4 Maximum Case Temperature: Transformer's case temperature shall not exceed 35°C above 40°C ambient.

2.2.5 Insulation: Transformer insulation shall be rated for 220ºC.

2.2.6 Sound Level: Transformer sound level, measured per ANSI-C89, shall not exceed:

| KVA | dB |
|---|---|
| 0 - 9 | 40 |
| 10 - 50 | 45 |
| 51 - 150 | 50 |
| 151 - 300 | 55 |
| 301 - 500 | 60 |

2.3 Sound/Vibration Isolation Pads: Provide sound/vibration isolation pads under all floor mounted transformers. Use neoprene-jacketed isolation material bonded to a tapped steel load plate; Model N as produced by Consolidated Kinetics Corporation or approved equal. Use size recommended by pad producer for each size of floor-mounted transformer. Sound/vibration isolation pads are in addition to internal sound isolation

pads supplied with transformers.

3. EXECUTION

3.1 Provide minimum 6" clear space between transformer case and all adjacent walls. Use flexible metal conduit and loop it to allow free motion of transformer.

3.2 Sound/Vibration Isolation Pads: Install pads in accordance with producer's instructions. Insure there is no direct contact between transformer and building floor or concrete pad.

END OF SECTION

SECTION 16521/LIGHTING FIXTURES

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals:

1.3.1 Submit in brochure form, catalog sheet or cuts of all lighting fixtures. Mark each sheet to match "type" number as specified in Fixture Schedule on the Drawings. Fabricate no fixtures until approval of submittals and catalog cuts have been made.

1.3.2 Fixtures described do not include all stem hangers, frames and other necessary accessories. At each location, provide lighting fixture specified and all accessories necessary for proper installation and operation.

1.3.3 Provide lighting fixtures complete with lamps in accordance with the Fixture Schedule on the Drawings.

2. PRODUCTS

2.1 Acceptable Producers: Ballasts produced by Advance, MagneTek, Osram, or approved equal are acceptable; and lamps may be produced by Phillips, Osram, or Sylvania. See Lighting Fixture Schedule on the Drawings for producers of lighting fixtures.

2.2 Ballasts:

2.2.1 Ballasts shall be electronic, high frequency (at least 20 KHz), instant start type. Ballasts for 4' fluorescent lamps shall be designed specifically for use with 265mA T8 lamps. Compact fluorescent ballasts shall illuminate lamps immediately with no noticeable delay.

2.2.2 Ballasts shall be UL listed (class P) with a class A sound rating, and they shall be CBM certified by ETL. Ballasts shall be the energy saving type and shall have a minimum starting temperature of +50°F. Ballasts shall be serviceable while fixtures are in their normally installed position and shall not be mounted to removable reflectors or wireway covers.

2.2.3 Ballasts shall produce less than 20% current Total Harmonic Distortion (THD) and shall operate at a power factor of at least 90%.

2.2.4 Ballasts shall be capable of operating two, three, or four T8 lamps.

2.2.5 Qualifying manufacturers shall have been manufacturing electronic fluorescent ballasts for a minimum of five years with a satisfactory performance record. Ballasts shall be warranted by the manufacturer for a minimum of three years.

2.3 Automatic Resetting Thermal Protectors: Furnish with each fluorescent ballast to provide protection against damage.

2.4 Fixtures: See Lighting Fixture Schedule in the drawings.

2.5 Fixture Wire: Type SF-1, SF-2, TF, TFF, TFN, TFFN or other approved wire.

2.6 Gasket: Provide gaskets on all lenses to prevent light leaks. Provide gaskets on all fixtures located in damp and wet locations.

2.7 Plaster Frames: Furnish with all fixtures installed in stucco or plaster surfaces.

2.8 Plastic Accessories: Use 100% clear virgin methyl methacrylate. Lenses shall be male conical prismatic type, with minimum thickness of .125 inch.

2.9 Lenses and Diffusers: Incandescent fixture lenses and diffusers shall be tempered glass, unless scheduled otherwise.

2.10 Sloped-Ceiling Adapters (whenever available for a fixture type as a standard option and unless stated otherwise on the Drawings) shall be provided in all locations where electrical drawings indicate lighting fixtures being installed in ceilings which are not flat. Refer to architectural documents for the locations of all sloped ceilings. Any ceilings with less than 2° (from horizontal) rise in elevation – in all directions – shall be considered to be flat for the purposes of this section of the project manual. Any ceilings with 2° or more rise in elevation shall be considered to not be flat.

2.11 Lamps: Fluorescent lamps shall be 4-foot, 32 watt, 265mA, T-8 Octron with 4100K color temperature and minimum Color Rendering Index (CRI) of 75, unless otherwise noted in the Fixture Schedule on the Drawings. Lamps shall be Phillips, Sylvania, Osram, or approved equal. Lamps shall have a rated life of 15,000 hours with instant start ballast. Incandescent lamps shall be inside-frosted, long life unless noted otherwise. Incandescent lamps shall be rated 130 volts.

2.12 Lamp Sockets:

2.12.1 Fluorescent: Lampholder contacts shall be the biting edge type or phosphorous-bronze with silver flash contact surface type. Lampholders for bi-pin lamps, with the exception of those for "U" type lamps, shall be of the telescoping compression type, or the single slot entry type requiring a one-quarter turn of the lamp after insertion.

2.12.2 Incandescent: Lampholder contacts for incandescent lamps shall have porcelain enclosures.

3. EXECUTION

3.1 Where a fixture type is not designated on Electrical Drawings, install the fixture type used in a similar location.

3.2 Locate fixtures to suit architectural detail of area involved. Where located in acoustic

ceilings, coordinate placement with architectural reflected ceiling plan, or if such plan is not available, obtain approval of fixture location.

3.3 Fixture Schedule on the Drawings shows type of fixture required. Determine modifications to make fixtures suitable for the ceilings in which they are installed and furnish fixtures adapted to ceiling.

3.3.1 Ceiling types are often subject to change late in project design. Verify the types of ceiling construction before ordering fixture fabrication. Determine that suspension methods and flange arrangements for fixtures coordinate with ceiling types and their suspension systems. Immediately report in writing to the Engineer any discrepancies discovered. Options and fixture types stated regarding ceiling types as indicated on electrical Drawings shall be considered for bidding purposes only. Contractor is responsible for providing fixture types and options appropriate to accommodate ceiling types specified by Architectural Documents even if electrical drawings indicate options or fixture types for different ceiling type.

3.4 Determine exact inscription for exit signs.

3.5 Interferences: In areas where industrial type fixtures are to be installed, such as equipment rooms, fixtures which are near obstructions such as ducts, large pipes, groups of pipes, etc., are to be suspended so that bottom of the fixture is not higher than bottom of duct, etc. Do not locate outlets until locations of these obstructions are determined. Install conduits and outlets exposed to insure accessibility.

3.6 Protect all fixtures and lamps and replace broken parts including those for temporary lighting system.

3.7 Clean all lenses and louvers after all other trades have completed their work in each area; or do not install lenses and louvers before that time.

END OF SECTION

SECTION 16530/LIGHTING FIXTURE, HIGH INTENSITY DISCHARGE LAMP TYPE

1. GENERAL

1.1 Comply with the sections:

1.1.1 Electrical/General

1.1.2 Electrical/Related Divisions

1.1.3 Electrical/Codes, Standards and Inspections

1.2 Submittals:

1.2.1 Submit the producers standard-descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1 Acceptable Producers: See Lighting Fixture Schedule for producers.

2.2 Fixture Wire: Type SF-1, SF-2, TF, TFF, TFN, TFFN or other approved wire.

2.3 Gasket: All lenses where necessary to prevent light leaks.

2.4 Ballasts: Generally shall be constant wattage. Isolate and pot all ballasts for sound attenuation. Fixture manufacturer shall submit data to substantiate their fixture meeting or surpassing a noise criteria of 30 with the fixture in the ceiling locals shown.

2.5 Lenses: Of tempered glass, unless scheduled otherwise.

2.6 Fuses: Furnish fuse and fuse holders for each ballast.

3. EXECUTION

3.1 Where a fixture is shown but not designated on the electrical drawings install the fixture type used in a similar location.

3.2 Locate fixtures to suit architectural detail of the area involved. Where located in acoustic ceilings, coordinate placement with architectural reflected ceiling plan, or if such plan is not available, obtain approval of fixture location.

3.3 Interferences: In areas where industrial type fixtures are to be installed, such as equipment rooms, fixtures which are near obstructions near ceiling, such as ducts, large pipes, groups of pipes, etc., are to be suspended so that bottom of the fixture is not higher than bottom of duct, etc. Do not locate outlets until locations of these obstructions are determined. Install conduits and outlets to insure accessibilty.

3.4 Protect all fixtures and lamps and replace broken parts.

3.5 Clean all lenses and louvers after all other trades have completed their work in each area, or do not install lenses and louvers before that time.

END OF SECTION

# SECTION 16540/LIGHTING FIXTURE SUPPORTS, STANDARDS AND POLES

## 1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

## 2. PRODUCTS

2.1 Support suspended fixtures by stems designed and supplied by fixture producer. Use no chains except as otherwise noted. Use no threaded rods except as otherwise noted.

2.2 Verify fixture mounting heights before ordering stems.

2.3 Provide fixtures for ceiling or wall surface mounting with fixture producer's brackets for that fixture and application.

2.4 Recessed fixtures may be supported from channels provided for suspended ceiling. Ceiling supplier shall verify adequacy of the installation. Provide clips to secure recessed fixtures to the suspended ceiling grid system.

2.5 The fixtures described do not include all stem hangers, plaster frames, etc. Contractor shall furnish lighting fixtures of the type and quality specified with all necessary accessories at each location.

2.6 Provide standards and poles as indicated on the Drawings.

## 3. EXECUTION

3.1 Provide additional supports in ceiling when two fixtures abut.

3.2 Mount fixtures in equipment rooms after equipment has been installed, to provide best pathway and work lighting.

3.3 Unless indicated otherwise on Drawings, in all areas where ceilings are sloped or otherwise not level, contractor shall provide sloped-ceiling adapters for all lighting fixtures for which sloped-ceiling adapters are available as a standard fixture option.

3.4 Fixture Mounting Heights:

3.4.1 The following mounting heights apply in general to lighting fixtures which may be either ceiling or stem mounted except as otherwise noted on the Drawings.

| Ceiling Height | Mounting |
|---|---|

| | |
|---|---|
| 9'-0" or less | ceiling mount. |
| over 9'-0" and less than 12' | stem mount. |
| over 12' | as indicated on Drawings |

Note: Generally mount bottom of fixture 9'-0" above finished floor.

END OF SECTION

# SECTION 16600/LIGHTNING PROTECTION SYSTEM - CLASS I MATERIALS

## 1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals:

1.3.1 Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

1.3.2 Submit layout of the conductors coursed over the roof including the runs, cross runs and down conductors.

1.4 Labels: Label A for lighting conductors, Label B for air terminals and Label C for Master Label attached to the building all in compliance with the Underwriter's Laboratories, Inc. Master Label Service, UL 96A.

1.5 Code Compliance: Provide in compliance with NFPA-780.

## 2. PRODUCTS

2.1 Acceptable Producers: Robbins Lightning Protection, Thompson Lightning Protection, Heary.

2.2 Materials for this system shall be Class I and of copper, brass, bronze, aluminum, or stainless steel (chrome-nickel). All materials which may come in contact with aluminum surfaces – or runoff from aluminum surfaces – shall be made of aluminum or other such materials which are listed for use with the type of surfaces to which it is exposed. Any materials which may come in contact with any copper surfaces – or runoff from any copper surfaces – shall not be aluminum. All air terminals, connectors, and other materials located above aluminum roofing shall be aluminum. No aluminum materials shall be used less than 18" above grade. No aluminum materials shall be attached to a surface coated with alkaline-base paint or embedded in concrete or masonry. No aluminum conductor shall be installed in a location where it is exposed to excessive moisture. The connectors used to bond aluminum to non-aluminum materials shall be bimetallic type specifically made for use in connecting the specific types of dissimilar metals used. The bimetallic connectors used for bonding aluminum down conductors to copper or copper-clad ground grounding equipment shall be located at least 18" above grade. All connections used for aluminum conductors shall be compression-type connectors. All materials shall be suitable for use with the conductor and the surfaces on which they are installed, and all materials shall be suitable for the application in which they are used.

2.3 Air Terminals: Air terminals shall have the equivalent stiffness of copper tubes 5/8" outside diameter and wall thickness of 0.033". Rods shall have pointed terminal and extend a minimum of ten inches above object to be protected. Solid copper rods shall have minimum diameter of ½", and tubular copper rods shall have minimum diameter of 5/8" with a minimum wall thickness of 0.033". Solid aluminum air terminals shall be minimum diameter of ½", and tubular aluminum air terminals shall have a minimum diameter of 5/8" with a minimum wall thickness of 0.064".

2.4 Conductors: Main down and tie conductors shall be minimum size of #2 AWG bare stranded copper (187.5 lbs/1000 ft.) or #1 AWG bare stranded aluminum (95.5 lbs /1000 ft.). Ties to major metal masses shall be same size as main conductor. Miscellaneous ties to sheet metal and flashing shall be minimum size of #6 AWG bare stranded copper or equivalent braid or shall be minimum size of #4 bare stranded aluminum or equivalent braid.

2.5 Supports: Conductor supports shall be corrosion resistant type, adapted to particular installation location.

2.6 Ground Connections: Provide one (1) for each down conductor preference being given to metal water pipes or other large underground metallic structures. If driven grounds are used, locate them a minimum of two feet from building foundation. Place conductors connecting to grounds 30" below finished grade. Driven grounds shall be copper weld rod having minimum of length of 10 feet and minimum diameter of 3/4".

3. EXECUTION

3.1 Air Terminals: Place on all parapets and ridges not more than 20 feet apart. Install perpendicular to parapet on adjustable angle base.

3.2 Bond all metal masses within six feet of the main conductors. Bond water piping system to conductors preferably at or near ground level. Conceal down conductors within the building structure unless indicated otherwise. Install in 1" PVC conduit.

3.3 Joints, Bends and Supports in Conductors: Joints shall be as few in number as possible, mechanically strong and shall provide contact area not less than double the cross sectional area of conductor. Make all joints with corrosion-resistant materials. Joints shall be compression type, or thermite welding. Bends shall be gradual with minimum angle not less than 90°. Radii of bends at eaves, etc., shall be not less than 8". Place supports a maximum of 4 feet apart. Supports on roof may be fastened with plastic cement, all others shall be bolted.

3.4 Ground Rods: Install sufficient length or number of grounds to give maximum resistance of 5 OHMS at each down conductor location.

3.5 Comply with the installation requirements of UL 96A.

3.6 Certification: Submit system as built for UL and LPI inspection and label. Attach Master Label and plates to building where directed by Architect.

END OF SECTION

# SECTION 16620/SURGE PROTECTION - SECONDARY

## 1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow. Submittal shall include UL 1449 Listing Classification file indicating level of containment which the device has demonstrated in UL fault current tests.

## 2. PRODUCTS

2.1 Acceptable Producers: Advance Protection Technologies, Siemens TPS, General Electric, Joslyn Mfg. & Supply Co., McGraw-Edison, RTE Corp., Leviton, Wiremold, LEA Dynatech, Intermatic.

2.2 General: Units shall be designed for application on systems up to 600 volts, 60 Hz, with the number of phases shown in the Drawings for the equipment where installed. Units shall be UL Listed in accordance with UL 1283 and 1449 Second Edition, including the highest fault current of Section 37.3.

2.3 Characteristics: Surge protection device shall prevent power surges and spikes from damaging electrical equipment or system it protects. Unit shall have a maximum continuous operating voltage of not less than 115% of nominal phase-to-neutral operating voltage of equipment protected. TVSS unit shall be marked with a Short Circuit Current Rating (SCCR) which is equal to or greater than that which is indicated in the Contract Documents for the equipment protected; series-rated combinations are prohibited; only fully-rated devices shall be provided. Shall provide line-neutral, line-ground, and neutral-ground modes of protection for Wye (such as 3-phase 4-wire) systems and shall have line-line and line-ground modes of protection in Delta wiring systems. UL 1449 Listed Line Suppressed Voltage Ratings for line-neutral, line-ground, and neutral-ground modes of protection shall not exceed 400V for 208Y/120V equipment and shall not exceed 800V for 480Y/277V equipment. TVSS shall meet or exceed the following surge capacities: 240kA modular for main distribution equipment, 160kA modular for distribution switchboards and panelboards supplied by main distribution equipment, and 120kA non-modular for branch panelboards. TVSS shall have EMI/RFI (Electro-Magnetic Interference/Radio-Frequency Interference) filtering with minimum attenuation of -40dB at 100kHz.

2.4 Design: Surge suppressor shall be completely self-contained in metal enclosure and arranged for knockout mounting on panelboards. Provide complete with factory leads.

## 3. EXECUTION

3.1 Provide materials and labor necessary to provide Transient Voltage Surge Suppression (TVSS) at the following locations in the electrical system provided under this contract: at service entrance disconnection means (main distribution equipment), at designated panelboards, at all panelboards provided which supply either fluorescent lighting loads or power receptacles adjacent to computer data or phone outlets, and at other locations as indicated on the Drawings. This shall include – but shall not be limited to – providing additional circuit breakers and labor as necessary to ensure that TVSS unit is installed in compliance with manufacturer's instructions and the requirement that unit's conductor lengths be minimized; this shall include labor to relocate circuit breakers and re-label circuit directories as necessary to shorten these conductor lengths by locating TVSS unit as close as possible to connection points. Properly connect to phase conductors and to ground as recommended by the manufacturer.

END OF SECTION

SECTION 16712/TELEPHONE, COMPUTER, TELEVISION SYSTEMS

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

2. PRODUCTS

2.1 Provide raceways, fittings and boxes that conform to the Section "Basic Materials and Methods."

3. EXECUTION

3.1 Telephone, Computer Data, and TV distribution conduit systems shall be complete including outlets and conduits for feeder cables. Provide terminal boards required for the systems. Utility companies and Owner will provide all telephone, computer data, and TV distribution service cables.

3.2 Provide boxes and conduits with pull wire or pull rope for installation of the systems. See Drawings for sizes and locations.

3.3 Ream out all conduits. Conduits not terminating in boxes or cabinets shall be terminated with bushings.

3.4 Conduit with more than three right angle bends, or exceeding 200 feet in length shall have an intermediate pull box. Pull boxes shall have full size screw-fastened covers.

3.5 All wall outlets shall be flush and have nylon or fiberglass reinforced cover with bushed opening.

3.6 Refer to the Drawings for feeder conduit sizes.

3.7 Installation of devices, equipment and feeder cables are not included in the work of this Contract.

END OF SECTION

SECTION 16721/DOOR MONITORING SYSTEM

1.0 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals:

1.3.1 Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

1.3.2 Submit a "point to point" wiring diagram with the connections to the equipment and terminal cabinets. Indicate the equipment numbers, terminal numbers, wire numbers, and wire colors. The submittal shall be made for approval prior to the installation of the wiring in the raceways.

1.4 System Description: The system shall include door monitor switches on exit doors on the first floor and electric strike on main entrance with remote access.

1.5 System Operation

1.5.1 Door monitor switches shall be provided on each exit door at first floor level. Any attempt to use doors, from either inside or outside during non-visiting hours shall be monitored at an annunciator panel at the nurses' station.

1.5.2 An electric strike shall be provided on main entrance door. Access to building after hours shall be gained by calling the nurses station from a speaker with a call-in switch located next to door. Entry shall be allowed by pressing electric strike release button located at the nurses' station.

2.0 PRODUCTS

2.1 Door Monitor System: Provide a complete two-way after hour intercom system between the main entrance and the nurses station and selected door monitoring.

2.1.1 Main entrance door call station shall have a two-way speaker and emergency call push button mounted in a backbox with stainless steel cover. Cover plate screws shall be tamperproof.

2.1.2 Nurses station annunciator shall have a two-way speaker, door pilot lights for each exterior door and push-to-talk switch mounted in a wall mounted backbox. Cover of backbox shall be stainless steel. Label pilot lights for each door.

2.1.3 Activation of a door switch at exterior doors shall cause pilot light to light on nurses station annunciator. Two-way communications between main door and nurses station

will be established by pressing a call-in switch at the main entrance.

2.2 Door Monitoring System: Provide a door monitoring system to monitor exterior exit doors on first floor.

2.2.1 Provide lock assemblies mounted on the door frame in a completely enclosed tamper resistant cast aluminum housing containing an electromechanical locking mechanism, electronic door position sensor independent hydraulic override cylinder and junction box for low voltage electrical connections.

2.2.2 Self-aligning keeper assemblies shall be mounted on the inside face of doors.

2.2.3 Door signs mounted on main door shall read "Push Button for Entrance After Hours".

2.2.4 Provide annunciator panel in nurses station with zone lights for each door. Console shall monitor each door independently.

2.2.5 Provide 24 volt - DC power supply for system.

2.2.6 During fire alarm situations, door monitoring system shall be immediately deactivated by a signal from the fire alarm system. Door guard system shall also be deactivated upon loss of building power and from the annunciator panel in the nurses station.

2.3 Main Entrance System: Provide a remote controlled electric strike system on doors at main entrance. Control of electric strike shall be from nurses station.

2.3.1 Electric strike shall be 24 volt - DC. Provide power supply and remote control push button in nurses station. Provide strike and coordinate installation with door manufacturer.

2.3.2 Speaker and call-in switch at main entrance shall be wall mounted near entrance. Automatic buzzer at nurses station will sound when call-in switch is pressed.

3.0 EXECUTION

3.1 Wiring: Shall be in metallic conduit solely for door monitoring system. Install and connect in conformance with the producers recommendations and wiring diagrams.

3.2 All wiring shall be copper, color coded and be identified by being tagged, numbered and terminated on terminal blocks in the cabinets, in boxes, at equipment and at devices.

3.3 Tests:

3.3.1 Activate each device and check each audible and visual alarm for function.

3.3.2 Repeat test with "Normal" power disconnected.

3.3.3 Perform test in the presence of Owner's representative.

3.4 Furnish 4 bound copies of brochure including maintenance instruction, spare parts list, wiring diagrams and troubleshooting check list.

END OF SECTION

SECTION 16731/FIRE DETECTION AND ALARM SYSTEM - ADDRESSABLE (CLASS B)

1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.2.1 The fire alarm system shall be installed by a state certified fire alarm system installation contractor with an unlimited electrical license (Type EC) or a certified alarm system contractor I license (Type EF). The installation contractor shall also be either the prime contractor or a subcontractor to the prime contractor and shall not be a subcontractor to another subcontractor.

1.2.2 The contractor shall warrant the fire alarm system for a period of one year from the later of the following dates: the date of final acceptance by the state fire marshal or the date of substantial completion.

1.3 Submittals for Approval:

1.3.1 Prior to beginning any work on the fire alarm and detection system, submit for approval a copy of the appropriate license certifying that the installation contractor is legally qualified to install the fire alarm and detection system.

1.3.2 Submit the manufacturer's standard descriptive data sheets for each type of product being provided. Mark the data sheets for the products being provided with an identifying mark or arrow. Provide shop drawings showing locations of all equipment and devices connected to the fire alarm control panel including – but not limited to – terminal cabinets, air handler shutdown relays, smoke damper relays, remote reporting relays and any other connections to mechanical systems. Indicate the device types, device location descriptions, signal types (whether device generates an Alarm or Supervisory signal) and device addresses to be programmed into the control panel. In this submittal, include a description of the default method used to prioritize multiple initiating signals when they are displayed at the fire alarm control panel and annunciators. The submittal shall be made for approval prior to the installation of wiring in the raceways.

1.4 Close-out Submittals:

1.4.1 Two weeks prior to substantial completion, three bound copies of the operation and maintenance manuals shall be provided. These manuals shall include, but are not limited to, diagrams and instructions which detail installation, operation and maintenance of the fire alarm and detection system. The maintenance instructions shall include a spare parts list and troubleshooting instructions. The contractor shall also provide a 3.5" diskette with a copy of the job data – specific to this project – which is necessary to reprogram the system.

1.4.2 Fire alarm supplier shall submit battery life calculations verifying that the fire alarm system is capable of operating on battery backup for 60 hours plus five minutes with the

alarm sounding.

1.4.3 A point-to-point wiring diagram showing all equipment connected to the fire alarm and detection system shall be included with both the paper and computer diskette copies of the As-Built Drawings. This wiring diagram shall indicate equipment names and numbers, terminal numbers, wire numbers and device types, locations and addresses.

1.5 Quality Assurance:

1.5.1 Manufacturers shall be firms which have been regularly engaged in the production of fire alarm and detection devices and systems which are of the same type, size and characteristics required for this project and which have been installed, with satisfactory records, in similar projects for not less than five years.

1.5.2 The installer shall have at least five years of successful installation experience on projects with fire alarm and detection system installation work similar to that required for this project.

1.6 System Description:

1.6.1 The fire detection and alarm system shall be a combination non-coded, Class B, multiplex, fully addressable, electrically supervised, manually and automatically activated, direct current powered system with batteries, battery charger, speakers and flashing visual alarm lights, recall capability and remote reset of smoke detectors and alarm.

1.6.2 The system shall be transient protected modular microprocessor-based with microprocessor-based remote transponders when required. The system shall include a fire alarm annunciator panel in the location shown on the drawings. System operation shall be supervised, manual operated and automatic initiating.

1.6.3 The fire alarm and detection system shall be capable of registering Alarm and Trouble signals as a minimum. Support for Supervisory signals shall be provided as indicated on the Drawings for a non-sprinklered building.

1.7 System Operation:

1.7.1 The system shall monitor all inputs and outputs for abnormal conditions. A single open or non-simultaneous single ground fault shall not inhibit communication between the control panel and any of the devices except those wired on the other side of the fault from the control panel. All open or ground faults shall cause a Trouble signal unless the fault occurs under circumstances listed as one of the exceptions in section 1-5.8.1 of NFPA Article 72.

1.7.2 The recall signal shall be separate and distinct from any other signal. The recall control, push button or other type shall be located in the fire alarm control panel under lock and key.

1.7.3 Operation of any manual or automatic initiating device shall sound all alarm signals and shall also sound an alarm and indicate, on the fire alarm annunciator and fire alarm

control panels, the locations of all activated initiating devices.

1.7.4 Operation of any manual or automatic initiating device shall shut down all air handling units in the building unless noted otherwise on the Drawings.

1.7.5 Malfunction of supervised circuits – either Alarm or Supervisory – shall be indicated as Trouble on the fire alarm annunciator and control panels. An audible and visual signal shall indicate Trouble with provisions to silence the audible signal but not the visual indication.

1.7.6 Activation of the fire alarm and detection system's Alarm, Supervisory or Trouble signals shall operate the necessary contacts to communicate the signals to remote locations as required by the owner. The Alarm contacts shall be normally open and the Trouble and Supervisory contacts shall be normally closed. The system shall be provided with a digital communicator which shall use standard telephone lines for this purpose.

1.7.7 If elevator is provided; activation of elevator lobby smoke detectors shall cause elevator car to return nonstop to the designated level (ground floor), or to the alternate level (second floor), if the alarm originated from the designated level. These smoke detectors shall also sound a general alarm.

1.7.8 If elevator is provided; activation of elevator equipment room smoke detector shall activate Phase I elevator recall, cause the "Do Not Use Elevator" warning sign to flash, and shall sound a general alarm. The Warning sign shall be located at the elevator call buttons on both the designated and alternate levels.

1.7.9 If elevator is provided; activation of the smoke detector in the elevator shaft shall sound a general alarm in addition to activating Phase I recall.

1.8 The system shall have the ability to operate with non-addressable devices This ability shall be provided through the use of individual addressable modules designed specifically for this purpose.

2. PRODUCTS

2.1 Acceptable Producers:

2.1.1 Subject to compliance with other requirements, provide fire alarm and detection systems of one of the following manufacturers: Simplex, Notifier, Edwards Systems Technology.

2.1.2 All fire alarm and detection system components provided shall be specifically UL listed and labeled for use with the particular brand and type of fire alarm and detection system to which they are connected, and wherever possible, shall have the same manufacturer as the fire alarm and detection system control panel.

2.2 Materials and Equipment:

2.2.1 Pull Stations (Manual Fire Alarm Boxes): Shall be intelligent addressable type, single action, non-coded, break glass rod model, keyed alike for all cabinets and boxes in

system and with key lock for test and reset, recessed pull lever and protective shield. Boxes shall have surface or semi-flush mounting and cast metal or Lexan box with red finish.

2.2.2 Smoke Detectors: Shall operate on the photoelectric principle to detect and report the presence of products of combustion gases. Smoke detectors shall have matching base and shall be intelligent addressable type. The detectors shall support automatic compensation adjustment of setpoints and measurement of analog detector sensitivity from the fire alarm control panel. The detectors shall have built-in type identification and two blinking LEDs. The LEDs shall blink each time the device is addressed and shall be continuously illuminated when the device is in alarm. Ceiling smoke detectors shall mount on a 4" square box and shall have a remote reset at the control panel.

2.2.3 Smoke Detectors (Duct-Mounted): Shall operate on the photoelectric principle to detect and report the presence of products of combustion gases. Duct-mounted smoke detectors shall be intelligent, addressable type and provided with air duct type housing and sampling tubes (extended the full width of the duct). The detectors shall support automatic compensation adjustment of setpoints and measurement of analog detector sensitivity from the fire alarm control panel. The detectors shall have built-in type identification and two blinking LEDs. The LEDs shall blink each time the device is addressed and shall be continuously illuminated when the device is in alarm. Detectors shall be UL listed specifically for use in air handling systems. Detectors, including housing and sampling tubes, shall be listed or approved for the range of air velocities which may exist in service and for the maximum temperature which may exist in service. Duct-mounted smoke detectors connected in the signal actuating circuit of the fire protective signalling system shall be listed or approved for this application. A remote annunciator LED shall be provided where detector is concealed above ceiling or in other locations.

2.2.4 Speaker/Strobe Signal Appliance: Shall be a combined modular speaker and lamp assembly. Lamp shall be a Xenon strobe--clear or nominal white--with a minimum intensity of 75 candela (per requirements of UL 1971; compliance with UL 1638 at 75cd is not sufficient and shall not be approved unless device is also rated at minimum of 75cd per UL 1971). Housing shall be red in color. Sound intensity shall exceed 85 db at 10 feet. Appliances shall be semi-flush mounting. Assembly shall be DC operated. Assembly shall be ADA approved.

2.2.5 Strobe Signal Appliance: Shall be a modular lamp assembly. Lamp shall be a Xenon strobe – clear or nominal white – with a minimum intensity of 75 candela (per requirements of UL 1971; compliance with UL 1638 at 75cd is not sufficient and shall not be approved unless device is also rated at minimum of 75cd per UL 1971). Housing shall be red in color. Appliance shall be semi-flush mounting. Assembly shall be DC operated. Assembly shall be ADA approved.

2.2.6 Speaker Notification Appliance: Shall be semi-flush mounted, consisting of a thermoplastic injection molded acoustic panel and a 4" treated paper cone speaker. Sound intensity shall exceed 85 db at 10 feet.

2.2.7 Individual Addressable Modules: Shall be located in back boxes of field devices or in

enclosures near field devices. The individual addressable modules shall allow tamper switches, pressure switches or any other non-addressable devices to be addressed by the fire alarm control panel.

2.2.8 Remote LCD Annunciator: Shall be fully compatible with fire alarm control panel and shall have key controlled trouble silence, system reset, alarm silence and LCD readout matching control panel.

2.2.9 Fire Alarm Control Panel: Shall be a complete multiplex monitor and control system. The system shall consist of a 24 volt DC central control panel and, if necessary, 24 volt DC microprocessor-based remote transponders. The control panel shall be capable of retaining and displaying a non-volatile history of the last 200 Trouble signals, the last 200 Alarm signals and the last 200 Supervisory signals (if Supervisory capability provided). This history shall include, as a minimum, a description of which types of devices initiated the signals, what their locations are and the date and time the signal was initiated. Communication between the control panel and transponders shall be over loop conductor cables as described in Section 2.2.10, below. Separate power supplies and battery backups shall be provided for each transponder and the control panel. The system shall scan all inputs and outputs for abnormal conditions and shall report them in order of priority. The control panel shall support automatic compensation adjustment of set-points for any devices for which sensitivities change with time. The system shall allow measurement of analog detector sensitivity of devices from the control panel. The system shall allow the control panel to automatically determine what type of device is reporting to it based on the coded signal from the device. The control panel shall also be programmed to expect a particular device type for each address. The panel shall then verify that the device type reported matches the type which it expected and a Trouble signal shall be initiated if these types do not match.

2.2.10 Wiring: Conductors to connect the equipment and materials for the fire alarm system shall only be type THWN insulated copper conductors rated for 600 volts. System wiring shall be color coded as listed in Section 3.10, below. Wire size shall be as recommended by the Fire Alarm manufacturer. Addressable loop conductor data cables shall be two-conductor twisted shielded pairs.

## 3. EXECUTION

3.1 Wiring: Shall be in metallic conduit solely for the fire detection and alarm system. Install and connect wiring in conformance with the recommendations and wiring diagrams provided by the fire alarm and detection system manufacturer.

3.2 All wiring shall be tagged, numbered, color coded and terminated on terminal blocks in the cabinets, in boxes, at equipment and at devices. Wire nuts or splices shall not be used.

3.3 Comply with all NFPA requirements as applicable to construction and installation of fire alarm and detection components and accessories.

3.4 Mounting of pull stations shall be 48" above finished floor to bottom of box (Handicapped Code).

3.5 Mounting of audible/visual devices shall be 80" above finished floor to bottom of box (ADA).

3.6 Junction boxes and cabinets for the Fire Alarm System, shall be painted international fire red.

3.7 Provide, in a frame and under glass, a professionally-drafted Mylar plan of the building and site which denotes the locations and addresses of all devices connected to the fire alarm and detection system. Install frame near the fire alarm annunciator panel or at a location designated by the Owner's representative.

3.8 Provide a spare parts kit which includes the following: one of each kind of detector head and base, one pull station, one speaker-light combination, one speaker and two of any type of line resistor or capacitor necessary.

3.9 Duct-mounted smoke detectors shall be furnished by the fire alarm contractor, installed by a mechanical contractor, and wired by the fire alarm contractor.

3.10 New fire alarm conductors provided shall match the colors used for any existing fire alarm system conductors; or if none are existing, the following colors shall be used:

| | |
|---|---|
| Strobes: | Purple (-) White (+) |
| Initiating Circuits: | Yellow (-) Blue (+) |
| A/C and Ventilation Shut Down: | Orange (-) Brown (+) |
| Miscellaneous Circuits: | Tan (-) Violet (+) |
| Speakers: | Black (-) Clear (+) |
| Data: | Red Jacket. |

3.11 Tests: Upon completion of the installation, the contractor and the manufacturer's authorized representative together shall test every alarm initiating device for proper response and location indication, every alarm signaling device for effectiveness and all auxiliary functions. Repeat all tests with normal power disconnected. As a minimum, comply with Chapter 7 of NFPA 72. The owner and designated representative shall be given the opportunity to witness these tests. An itemized test report shall be submitted to the owner, detailing and certifying all results.

3.12 Instructions: Upon completion of installation and at the owner's convenience, furnish owner's designated representatives sixteen hours of complete instructions and training for operation and maintenance of system.

END OF SECTION

SECTION 16775/NURSE CALL SYSTEM

1.0 GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals:

1.3.1 Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

1.3.2 Submit a "point-to-point" wiring diagram with the connections to the equipment and terminal cabinets. Indicate the equipment numbers, terminal numbers, wire numbers, zone numbers and wire colors. The submittal shall be made for approval prior to the installation of the wiring in the raceways.

1.4 System Description: Furnish and install a complete Nurse Call System for building, locating calling stations, corridor lights and duty stations as indicated on the Drawings.

1.5 System Operation:

1.5.1 Pressing the button of any calling station shall light lamps in the associated corridor light, duty stations and Nurse's Station annunciator, and sound buzzers momentarily in duty stations

2.0 PRODUCTS

2.1 Acceptable Producers: The following manufacturers are acceptable if their system complies with all other requirements of the contract documents and performs the same functions as the design-basis DuKane system specified: DuKane, Executone, Tektone, or approved equal.

2.2 Master Station: The Master Station shall provide visual identification of all calls placed at patient, staff, or emergency stations in the system. Audio tones shall be provided to distinguish emergency calls from normal calls. Two-way communication shall be established between the Master Station and a calling station through a keyless handset or through a speaker/microphone. The Master Station operator may answer calls by direct selection of a pushbutton corresponding to the room or bed number. Provide a nurse call power unit with master station DuKane 12A2300C. Master Station shall have capacity for 40 stations minimum and be equal to DuKane 4A307xB series.

2.3 Patient Station: The Patient Stations shall provide calling facilities and two-way voice communications between patient and Nurse's Station. The type of call placed from station shall be indicated at the Nurse's Station and all duty stations in accordance with

the position of the status switch. Station shall be equal to DuKane 4A3080. Provide model 200-352 Call Cord.

2.4 Staff Station: The Staff Stations shall provide calling facilities and two-way communications between staff and Nurses Station. Station shall be equal to DuKane 4A3090.

2.5 Staff/Duty Station: Staff/Duty Stations shall provide calling facilities and two-way voice communications between staff and Nurse's Station. All calls placed on the system by other stations shall be indicated by light and electronic tone on this station. Station shall be equal to DuKane 4A3092.

2.6 Emergency Station: Stations shall provide emergency call by pulling the cord. Cancellation of the call shall be from the originating station. Stations mounted in showers shall be mounted 12" minimum above shower head. Station shall be equal to DuKane 9A3005.

2.7 Pocket Page Interface Kit and all other materials and labor necessary for accommodating this capability for eight pagers shall be provided. Each page request shall include the following: (1) source – room number of the ProCare 2000 System placing the call, (2) time – time and date of the request (call placed), and (3) pager ID number – ID number of the pager (receiver) being paged. This shall include – but shall not be limited to – providing a compatible RF (Radio Frequency) pocket pager system; PC Workstation (at minimum, a 300MHz Celeron™ processor running Windows NT Workstation 4.0 with service pack 6a or greater and Internet Explorer 5 or greater, with 64 MB RAM, 4 GB hard drive, 3.5-inch (1.44 MB) disk drive, CD-ROM drive, two 9-pin RS-232 serial ports, Ethernet compatible, 800 x 600 SVGA monitor, serial mouse, and full-function keyboard); and the number of pagers indicated above. The software provided shall have provisions for logging all activity. An authorized, trained technician shall be able to display and print a copy of a Radio (pocket page) Communication Log and a ProCare 2000 Communications Log at any time to determine the current status, historical performance, and listing of the most recent communication transactions between the interface PC and the ProCare 2000 system or the Pocket page system on a limited basis. Coordinate exact requirements with manufacturer and Owner, and coordinate exact locations for equipment with Owner and Architect. DuKane 438-842.

2.8 Corridor Lights: Wall mount corridor lights above doors. Lights shall be equal to DuKane 18A522 or 18A524.

2.9 Wiring: Conductors to connect the equipment and materials of Nurse Call System shall be twisted, shielded pair cables with PVC insulation. Shielding shall be foil, with bare drain wire.

3.0 EXECUTION

3.1 Wiring: Shall be in metallic conduit solely for the Nurse Call System.

3.2 All wiring shall be identified by being tagged, numbered, color coded and terminated on terminal blocks in the cabinets, in boxes, at equipment and at devices. Wire nuts or splices are not permitted. Each set of conductors shall be tagged with the number on

each conductor at termination (each end) and in each junction or pull box in the raceway system.

3.3 Tests: Activate each station and check each audible and visual alarm for function.

3.4 Furnish 4 bound copies of brochure including maintenance instruction, spare parts list, wiring diagram and trouble shooting check list.

END OF SECTION

# SECTION 16900/WORK REQUIRED FOR EQUIPMENT FURNISHED IN OTHER DIVISIONS

## 1. GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-16 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

## 2. PRODUCTS

2.1 Materials for this section are specified in the Section "Basic Materials and Methods."

2.2 Refer to the section "Related Divisions and Sections" for equipment that is furnished in other Divisions.

## 3. EXECUTION

3.1 Provide raceway boxes, fittings, devices and conductors for the electrical power to equipment furnished and installed in the other Divisions.

3.2 Make connections for the electrical power to equipment furnished and installed in other Divisions.

END OF SECTION