SPECIFICATIONS

FOR

DEPARTMENT OF ALCOHOLIC BEVERAGE CONTROL

NEW PLEASANT GROVE, UTAH LIQUOR STORE

DFCM Project No. 08225030

State of Utah-Department of Administrative Services

DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT

4110 State Office Building/Salt Lake City, Utah 84114/533-5561

JUNE 2009

DEPARTMENT OF ALCOHOLIC BEVERAGE CONTROL
NEW LIQUOR STORE

Table of Contents
July 2009

Division	Section Title

DIVISION 1 - GENERAL REQUIREMENTS

01010 SUMMARY OF WORK
01030 ALTERNATES
01040 PROJECT COORDINATION
01050 FIELD ENGINEERING
01200 PROJECT MEETINGS
01300 SUBMITTALS
01400 QUALITY CONTROL SERVICES
01500 TEMPORARY FACILITIES
01600 MATERIALS AND EQUIPMENT
01631 PRODUCT SUBSTITUTIONS
01700 PROJECT CLOSEOUT
01740 WARRANTIES AND BONDS

Appendix A-1 SUBSURFACE INVESTIGATION FOR PLEASANT GROVE
Appendix B LIQUOR STORE SHELF SEISMIC ANCHORAGE
Appendix C-1 FIRE FLOW TEST REPORT FOR PLEASANT GROVE

DIVISION 2 - SITE CONSTRUCTION

02200 EARTHWORK
02230 SITE CLEARING
02480 LANDSCAPING AND IRRIGATION SYSTEM
02510 WATER DISTRIBUTION
02513 ASPHALT CONCRETE PAVING
02520 PORTLAND CEMENT CONCRETE PAVING
02530 SANITARY SEWERAGE
02630 STORM DRAINAGE
02720 STORM SEWAGE SYSTEM
02753 CONCRETE PAVEMENT, CURBS AND SIDEWALKS
02765 PAVEMENT MARKINGS
02831 CHAIN LINK FENCES AND GATES
02870 SITE FURNISHINGS

DIVISION 3 – CONCRETE

03310 CONCRETE WORK
03450 ARCHITECTURAL PRE-CAST CONCRETE
03600 GROUT

DIVISION 4 – MASONRY

04200 UNIT MASONRY
04230 REINFORCED UNIT MASONRY
04240 ARTIFICIAL STONE

DIVISION 5 – METALS

05120 STRUCTURAL STEEL
05210 STEEL JOISTS AND JOIST GIRDERS
05310 CORRUGATED METAL DECK
05400 COLD-FORMED METAL FRAMING
05500 METAL FABRICATIONS
05520 HANDRAILS AND RAILINGS
05710 STAIR NOSINGS

DIVISION 6 - WOOD AND PLASTICS

06100 ROUGH CARPENTRY
06200 FINISH CARPENTRY
06402 INTERIOR ARCHITECTURAL WOODWORK

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07115 SHEET WATERPROOFING
07200 INSULATION
07241 SYNTHETIC STUCCO - EIFS
07311 ASPHALT SHINGLES
07321 ROOF TILES (Pleasant Grove)
07322 SLATE ROOFING SHINGLES (Alternate for Pleasant Grove)
07410 PREFORMED ROOFING AND SIDING
07511 THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING
07600 FLASHING AND SHEET METAL
07700 ROOF SPECIALTIES AND ACCESSORIES
07810 INSULATED TRANSLUCENT SKYROOF SYSTEM
07900 JOINT SEALERS

DIVISION 8 - DOORS AND WINDOWS

08100 HOLLOW METAL DOORS AND FRAMES
08211 FLUSH WOOD DOORS
08310 ACCESS DOORS AND PANELS
08360 SECTIONAL OVERHEAD DOORS (MOTORIZED)
08380 IMPACT TRAFFIC DOORS
08410 ALUMINUM ENTRANCES AND STOREFRONTS
08520 ALUMINUM WINDOWS
08710 FINISH HARDWARE
08711 CONTROLLING HARDWARE
08800 GLASS AND GLAZING

DIVISION 9 – FINISHES

09250 GYPSUM DRYWALL
09300 TILE
09511 ACOUSTICAL PANEL CEILINGS
09650 RESILIENT FLOORING
09680 CARPET
09900 PAINTING
09910 ANTI-GRAFFITI COATING

DIVISION 10 – SPECIALTIES

10260	WALL AND CORNER GUARDS
10500	METAL LOCKERS
10522	FIRE EXTINGUISHERS
10800	TOILET ACCESSORIES

DIVISION 11 – EQUIPMENT

11160	LOADING DOCK EQUIPMENT

DIVISION 12 – FURNISHINGS

12484	WALK-OFF MAT

DIVISION 13 - SPECIAL CONSTRUCTION

13900	FIRE SUPPRESSION

DIVISION 14 - CONVEYING SYSTEMS

NOT APPLICABLE

DIVISION 15 – MECHANICAL

15010	GENERAL MECHANICAL REQUIREMENTS
15060	HANGERS AND SUPPORTS
15070	MECHANICAL SOUND, VIBRATION AND SEISMIC CONTROL
15075	MECHANICAL IDENTIFICATION
15080	MECHANICAL INSULATION
15105	PIPES AND TUBES
15110	VALVES
15120	PIPING SPECIALTIES
15130	PUMPS
15140	DOMESTIC WATER PIPING
15150	SANITARY WASTE AND VENT PIPING
15160	STORM DRAINAGE PIPING
15190	FUEL PIPING
15300	FIRE SPRINKLERS & PIPING
15410	PLUMBING FIXTURES
15480	DOMESTIC WATER HEATERS
15550	BREECHING, CHIMNEYS AND STACKS
15736	PACKAGED ROOFTOP AIR CONDITIONING UNITS
15760	TERMINAL HEATING AND COOLING UNITS
15810	DUCTS
15820	DUCT ACCESSORIES
15830	FANS
15850	AIR INLETS AND OUTLETS
15950	TESTING, ADJUSTING AND BALANCING

DIVISION 16 – ELECTRICAL

16001	ELECTRICAL GENERAL PROVISIONS
16060	GROUNDING AND BONDING
16070	ELECTRICAL HANGERS AND SUPPORTS
16075	ELECTRICAL IDENTIFICATION
16123	BUILDING WIRE AND CABLE
16129	ELECTRIC HEAT ROOF GUTTER SNOW MELTING SYSTEM
16130	RACEWAY AND BOXES
16140	WIRING DEVICES GENERAL
16210	ELECTRICAL UTILITY SWITCHES
16261	UNINTERRUPTIBLE POWER SUPPLY
16411	ENCLOSED SWITCHES
16421	ENCLOSED CONTROLLERS
16442	PANELBOARDS
16510	INTERIOR LUMINAIRES
16520	EXTERIOR LUMINAIRES
16740	TELEPHONE DATA RACEWAY SYSTEM
16835	CLOSED CIRCUIT TELEVISION AND DIGITAL RECORDING SYSTEM
16900	FIRE ALARM DETECTION SYSTEM
16910	BUILDING SECURITY SYSTEM

DIVISION 1 - GENERAL REQUIREMENTS

Section 01010	**Summary of Work**
Section 01030	**Alternates**
Section 01040	**Project Coordination**
Section 01050	**Field Engineering**
Section 01200	**Project Meetings**
Section 01300	**Submittals**
Section 01400	**Quality Control Services**
Section 01500	**Temporary Facilities**
Section 01600	**Materials and Equipment**
Section 01631	**Product Substitutions**
Section 01700	**Project Closeout**
Section 01740	**Warranties and Bonds**
Appendix A-1	**Subsurface Investigation for Pleasant Grove**
Appendix B	**Liquor Store Shelf Seismic Anchorage**
Appendix C-1	**Fire Flow Test Report for Pleasant Grove**

SECTION 01010 - SUMMARY OF WORK

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 this Section.

1..2 PROJECT DESCRIPTION

A. The projects consist of the following:

1. Site development and construction of new State of Utah Alcoholic Beverage Control Liquor Store to be located on the northeast corner of Pleasant Grove Boulevard and Sam White Lane (700 South) in **Pleasant Grove, Utah** as shown on the accompanying drawings and described in the invitation to Bid.

B. Bidders will comply with the current codes and statues as adopted by the State of Utah, including, but not limited to: IBC 2006, IFC 2006, IPC 2006, IMC 2006, National Electric Code 2006, International Energy Conservation Code, ICC/ANSI A117.1-1998, Americans with Disabilities Act, and Building Board Policy Regarding Enhanced Accessibility to State Facilities which is attached to the RFP.

1..3 CONTRACTOR USE OF PREMISES

A. General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor's use of the premises is limited only by the Owner's right to perform construction operations with its own forces or to employ separate contractors on portions of the project, should the need arise.

1..4 OWNER-FURNISHED EQUIPMENT

A. The Owner will provide furniture for office areas, main floor shelving, check-out counters and limited toilet accessories as shown on the floor plan. The Work includes providing support systems to receive Owner's equipment, and mechanical and electrical connections.

END OF SECTION 01010

SECTION 01030 - ALTERNATES

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 this Section.

1..2 SUMMARY

A. This Section specifies administrative and procedural requirements for Alternates.

B. Definition: An Alternate is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in Contract Documents.

C. Coordination: Coordinate related Work and modify or adjust adjacent Work as necessary to ensure that Work affected by each accepted Alternate is complete and fully integrated into the project.

D. Notification: Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to Alternates.

1..3 SCHEDULE OF ALTERNATES

A. Alternate Bid Item No. 1:

SLATE SHINGLE ROOF

This alternate includes all labor and materials associated with the installation of a slate shingle roof (Specification Section 07322) in lieu of a concrete tile roof (Specification Section 07321).

END OF SECTION 01030

SECTION 01040 - PROJECT COORDINATION

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 this Section.

1..2 SUMMARY

A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:

1. Coordination.
2. Administrative and supervisory personnel.
3. General installation provisions.
4. Cleaning and protection.

B. Field engineering is included in Section "Field Engineering".

C. Progress meetings, coordination meetings and pre-installation conferences are included in Section "Project Meetings".

D. Requirements for the Contractor's Construction Schedule are included in Section "Submittals".

1..3 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project Close-out activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.

1..4 SUBMITTALS – ***NOTE: <u>ALL</u> SHOP DRAWINGS SHALL BE SUBMITTED TO THE ARCHITECT NO LATER THAN <u>60 CALENDAR DAYS</u> FOLLOWING CONTRACT AWARD. ANY INDIVIDUAL SHOP DRAWINGS WHICH ARE NOT SUBMITTED TO THE ARCHITECT WITHIN THE 60 CALENDAR DAY PERIOD, SHALL RESULT IN THE CONTRACTOR BEING ASSESSED LIQUIDATED DAMAGES IN THE AMOUNT OF $100 PER DAY PER LATE SUBMITTAL UNTIL THE SUBMITTAL IS RECEIVED BY THE ARCHITECT.***

A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the interrelationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "Submittals."
4. Refer to Division-15 Section "Basic Mechanical Requirements" and Division-16 Section "Basic Electrical Requirements" for specific coordination Drawing requirements for mechanical and electrical installations.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

1..1 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

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

D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

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

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

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

H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

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

1..2 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
   1. Excessive static or dynamic loading.
   2. Excessive internal or external pressures.
   3. Excessively high or low temperatures.
   4. Thermal shock.
   5. Excessively high or low humidity.
   6. Air contamination or pollution.
   7. Water or ice.
   8. Solvents.
   9. Chemicals.
   10. Light.
   11. Radiation.
   12. Puncture.
   13. Abrasion.
   14. Heavy traffic.
   15. Soiling, staining and corrosion.
   16. Bacteria.
   17. Rodent and insect infestation.
   18. Combustion.
   19. Electrical current.
   20. High speed operation,
   21. Improper lubrication,
   22. Unusual wear or other misuse.

23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION 01040

SECTION 01050 - FIELD ENGINEERING

PART 1 - GENERAL

1..1 RELATED DOCUMENTS

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

1..2 SUMMARY

A. General: This Section specifies administrative and procedural requirements for field engineering services, including, but not necessarily limited to, the following:

1. Land survey Work.
2. Building lay-out.

1..3 SUBMITTALS

A. Certificates: Submit a certificate signed by the Land Surveyor or Professional Engineer certifying that the location and elevation of improvements comply with the Contract Documents.

B. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of Sections "Submittals" and "Project Closeout".

1..4 QUALITY ASSURANCE

A. Surveyor: Engage a Registered Land Surveyor registered in the State where the project is located, to perform land surveying services required.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

1..1 EXAMINATION

A. The Owner will identify existing control points and property line corner stakes.

B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks before proceeding to layout the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference

points because of necessary changes in grades or locations.

2. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.

C. Establish and maintain a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

D. Existing utilities and equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction.

1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer and water service piping.

1..2 PERFORMANCE

A. Working from lines and levels established by the property survey, establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities, of marked lines and levels provided for their use.
2. As construction proceeds, check every major element for line, level and plumb.

B. Surveyor's Log: Maintain a surveyor's log of control and other survey Work. Make this log available for reference.

C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels and control lines and levels required for mechanical and electrical Work.

E. Existing Utilities: Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction.

F. Final Property Survey: Before Substantial Completion, prepare a final property survey showing significant features (real property) for the Project. Include on the survey a certification, signed by the Surveyor, to the effect that principal metes, bounds, lines and levels of the Project are accurately positioned as shown on the survey.

END OF SECTION 01050

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1..1 RELATED DOCUMENTS

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

1..2 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:

1. Pre-Construction Conference.
2. Pre-Installation Conferences.
3. Coordination/Progress Meetings.

B. Construction schedules are specified in another Division-1 Section.

1..3 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction conference and organizational meeting at the Project site or other convenient location prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: The Owner, Architect and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress including such topics as:

1. Tentative construction schedule.
2. Critical Work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of Shop Drawings, Product Data and Samples.
8. Preparation of record documents.
9. Use of the premises.
10. Office, Work and storage areas.
11. Equipment deliveries and priorities.
12. Safety procedures.
13. First aid.
14. Security.
15. Housekeeping.
16. Working hours.

1..4 PRE-INSTALLATION CONFERENCES

A. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. These meetings may be conducted with or adjacent to the regularly scheduled coordination meetings. The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Owner of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:

a. Contract Documents.
b. Options.
c. Related Change Orders.
d. Purchases
e. Deliveries.
f. Shop Drawings, Product Data and quality control Samples.
g. Possible conflicts.
h. Compatibility problems.
i. Time schedules.
j. Weather limitations.
k. Manufacturer's recommendations.
l. Compatibility of materials.
m. Acceptability of substrates.
n. Temporary facilities.
o. Space and access limitations.
p. Governing regulations.
q. Safety.
r. Inspection and testing requirements.
s. Required performance results.
t. Recording requirements.
u. Protection.

2. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Architect.
3. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1..5 COORDINATION/PROGRESS MEETINGS

A. Conduct Project coordination meetings at regularly scheduled times convenient for all parties involved.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

D. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
2. Review the present and future needs of each entity present, including such items as:

    a. Interface requirements.
    b. Time.
    c. Sequences.
    d. Deliveries.
    e. Off-site fabrication problems.
    f. Access.
    g. Site utilization.
    h. Temporary facilities and services.
    i. Hours of Work.
    j. Hazards and risks.
    k. Housekeeping.
    l. Quality and Work standards.
    m. Change Orders.
    n. Documentation of information for payment requests.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01200

SECTION 01300 - SUBMITTALS

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 this Section.

1..2 SUMMARY

A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including;

1. Contractor's construction schedule.
2. Submittal schedule.
3. Shop Drawings.
4. Product Data.
5. Samples.

B. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

1. Permits.
2. Applications for payment.
3. Performance and payment bonds.
4. Insurance certificates.
5. List of Subcontractors.

C. The Schedule of Values submittal is included in Section "Applications for Payment."

D. Inspection and test reports are included in Section "Quality Control Services."

1..3 SUBMITTAL PROCEDURES - ***NOTE: <u>ALL</u> SHOP DRAWINGS SHALL BE SUBMITTED TO THE ARCHITECT NO LATER THAN <u>60 CALENDAR DAYS</u> FOLLOWING CONTRACT AWARD. ANY INDIVIDUAL SHOP DRAWINGS WHICH ARE NOT SUBMITTED TO THE ARCHITECT WITHIN THE 60 CALENDAR DAY PERIOD, SHALL RESULT IN THE CONTRACTOR BEING ASSESSED LIQUIDATED DAMAGES IN THE AMOUNT OF $100 PER DAY PER LATE SUBMITTAL UNTIL THE SUBMITTAL IS RECEIVED BY THE ARCHITECT.***

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
2. Include the following information on the label for processing and recording action taken.

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Contractor.
e. Name and address of subcontractor.
f. Name and address of supplier.
g. Name of manufacturer.
h. Number and title of appropriate Specification Section.
i. Drawing number and detail references, as appropriate.

1..4 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar- chart type Contractor's construction schedule. Submit within 30 days of the date established for "Commencement of the Work".

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".
2. Within each time bar indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.
6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.

B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

1..5 SHOP DRAWINGS - ***NOTE: <u>ALL</u> SHOP DRAWINGS SHALL BE SUBMITTED TO THE ARCHITECT NO LATER THAN <u>60 CALENDAR DAYS</u> FOLLOWING CONTRACT AWARD. ANY INDIVIDUAL SHOP DRAWINGS WHICH ARE NOT SUBMITTED TO THE ARCHITECT WITHIN THE 60 CALENDAR DAY PERIOD, SHALL RESULT IN THE CONTRACTOR BEING ASSESSED LIQUIDATED DAMAGES IN THE AMOUNT OF $100 PER DAY PER LATE SUBMITTAL UNTIL THE SUBMITTAL IS RECEIVED BY THE ARCHITECT.***

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Initial Submittal: Submit one correctable translucent reproducible print and one blue- or black-line print for the Architect's review; the reproducible print will be returned.
7. Final Submittal: Submit 3 blue- or black-line prints; submit 5 prints where required for maintenance manuals. 2 prints will be retained; the remainder will be returned.

C. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.

1. Preparation of coordination Drawings is specified in section "Project Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.

1..6 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

a. Manufacturer's printed recommendations.
b. Compliance with recognized trade association standards.
c. Compliance with recognized testing agency standards.
d. Application of testing agency labels and seals.
e. Notation of dimensions verified by field measurement.
f. Notation of coordination requirements.

1..7 SAMPLES

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.

1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Architect's Sample. Include the following:
   a. Generic description of the Sample.
   b. Sample source.
   c. Product name or name of manufacturer.
   d. Compliance with recognized standards.

2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.
b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.

1..8 ARCHITECT'S ACTION

A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly.

B. Action Stamp: The Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. Final Unrestricted Release: Where submittals are marked "Approved," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
2. Final-But-Restricted Release: When submittals are marked "Approved as Noted," that part of the Work covered by the submittal may proceed, provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
3. Returned for Resubmittal: When submittal is marked "Not Approved, Revise and Resubmit," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark..
4. Architect will review with owner all submittal items that are of interest to the Owner. When appropriate, Architect’s review will be consistent with Owner’s wishes.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01300

SECTION 01400 - QUALITY CONTROL SERVICES

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 this Section.

1..2 SUMMARY

A. This Section specifies administrative and procedural requirements for quality control services.

B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Materials testing is the responsibility of DFCM.

1..3 RESPONSIBILITIES

A. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Owner, Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

1..4 SUBMITTALS

A. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Owner and Architect, in duplicate.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:
   a. Date of issue.
   b. Project title and number.
   c. Name, address and telephone number of testing agency.
   d. Dates and locations of samples and tests or inspections.
   e. Names of individuals making the inspection or test.
   f. Designation of the Work and test method.
   g. Identification of product and Specification Section.
   h. Complete inspection or test data.
   i. Test results and interpretations of test results.
   j. Ambient conditions at the time of sample-taking and testing.

k. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

1..5 QUALITY ASSURANCE

A. Qualification for Service Agencies: Engage inspection and testing 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 specialize in the types of inspections and tests to be performed.

PART 2 - PRODUCTS (Not Applicable).

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01400

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1..1 RELATED DOCUMENTS

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

1..2 SUMMARY

A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

B. Temporary utilities required include but are not limited to:
1. Water service and distribution.
2. Temporary electric power and light.
3. Telephone service.

C. Temporary construction and support facilities required include but are not limited to:
1. Temporary heat.
2. Field offices and storage sheds.
3. Sanitary facilities, including drinking water.
4. Temporary enclosures.
5. Temporary Project identification signs and bulletin boards.
6. Waste disposal services.

D. Security and protection facilities required include but are not limited to:
1. Temporary fire protection.
2. Barricades, warning signs, lights.
3. Enclosure fence for the site.
4. Environmental protection.

E. Comply with all requirements of DFCM Hazardous Materials Program Project Prerequisites contained within the RFP.

1..3 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:

1. Building Code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, Fire Department and Rescue Squad rules.
5. Environmental protection regulations.

B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.
2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

PART 2 - PRODUCTS

1..1 MATERIALS

A. Lumber and Plywood: Comply with requirements in Division-6 Section "Rough Carpentry."

1. For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thickness indicated.

B. Water: Provide potable water approved by local health authorities.

C. Open-Mesh Fencing: Provide 11-gage, galvanized 2-inch, 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.

1..2 EQUIPMENT

A. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.

B. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

C. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

D. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

E. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.

F. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

G. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber

reinforced polyester shell or similar nonabsorbent material.

H. First Aid Supplies: Comply with governing regulations.

I. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

PART 3 - EXECUTION

1..3 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.

1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.
4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner, and will not be accepted as a basis of claims for a Change Order.

B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.

1. Sterilization: Sterilize temporary water piping prior to use.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.

1. Except where overhead service must be used, install electric power service underground.
2. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

D. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.

E. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period. Install telephone on a separate line for each temporary office and first aid station. Where an office has more than two occupants, install a telephone for each additional occupant or pair of occupants.

1..4 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.
   1. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Provide incombustible construction for offices, shops and sheds located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.

C. Temporary Heat: Provide temporary heat required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

D. Heating Facilities: Except where use of the permanent system is authorized, provide vented self-contained LP gas or fuel oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open flame, or salamander type heating units is prohibited.

E. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings.

F. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

G. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

H. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.

I. Project Identification: Prepare project identification sign of 8’x 8’; install sign to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.

J. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

1..5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Except for use of permanent fire protection, as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion.

   1. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

B. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

C. Enclosure Fence: When excavation begins, install an enclosure fence with lockable entrance gates. Enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except by the entrance gates.
   1. Provide open-mesh, chain-link fencing with posts set in a compacted mixture of gravel and earth.

D. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.

E. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

END OF SECTION 01500

SECTION 01600 - MATERIALS AND EQUIPMENT

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 this Section.

1..2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

1..3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms such are self-explanatory and have well recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   a. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1..4 QUALITY ASSURANCE

A. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

   a. Name of product and manufacturer.
   b. Model and serial number.
   c. Capacity.
   d. Speed.
   e. Ratings.

1..5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

PART 2 - PRODUCTS

1..1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.

1. Provide products 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.

B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
2. Semi proprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.
   a. Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
3. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
   a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
6. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.

7. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Owner will select the color, pattern and texture from the product line selected.
8. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division-1 for allowances that control product selection, and for procedures required for processing such selections.

PART 3 – EXECUTION (Not Used)

END OF SECTION 01600

SECTION 01631 - PRODUCT SUBSTITUTIONS

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 this Section.

1..2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section "Submittals."

1..3 DEFINITIONS

A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions:

1. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
2. Revisions to Contract Documents requested by the Owner or Architect.
3. Specified options of products and construction methods included in Contract Documents.
4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1..4 SUBMITTALS

A. Substitution Request Submittal: Requests for substitution will be considered if received within 30 calendar days after commencement of the Work. Requests received more than 30 calendar days after commencement of the Work may be considered or rejected at the discretion of the Owner.

1. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.
2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
   a. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
   b. Samples, where applicable or requested.

PART 2 - PRODUCTS

1..1 SUBSTITUTIONS

A. Conditions: The Contractor's substitution request will be received and considered by the Owner when one or more of the following conditions are satisfied, as determined by the Owner; otherwise requests will be returned without action except to record noncompliance with these requirements:

1. Extensive revisions to Contract Documents are required.
2. Proposed changes are in keeping with the general intent of Contract Documents.
3. The request is timely, fully documented and properly submitted.
4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
5. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
6. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear.
7. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
8. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
9. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01631

SECTION 01700 - PROJECT CLOSEOUT

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 this Section.

1..2 SUMMARY

A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
   1. Inspection procedures.
   2. Project record document submittal.
   3. Operating and maintenance manual submittal.
   4. Submittal of warranties.
   5. Final cleaning.
   6. Extra stock.

1..3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following:

   1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
   2. Advise Owner of pending insurance change-over requirements.
   3. Submit ***specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents***.
   4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
   5. Submit ***record drawings***, ***operation and maintenance manuals***, property survey, and similar final record information to Architect.
   6. Deliver tools, spare parts, extra stock, and similar items.
   7. Make final change-over of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of change-over in security provisions.
   8. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
   9. Architect to submit to Owner record drawings, 1 copy of original tracings and 1 electronic copy of same.
   10. Obtain Occupancy Permit from State Fire Marshall.

1..4 FINAL ACCEPTANCE

A. Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following:

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit consent of surety to final payment.
4. As-Built documents.

1..5 RECORD DOCUMENT SUBMITTALS

A. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown.

B. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

C. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.
8. Fixture lamping schedule.

PART 2 - PRODUCTS (Extra Stock)

The contractor shall furnish the following extra stock (if used on this project) described below and also as described in individual specification sections, to the owner and stored in a location designated by the owner:

Floor and wall tile:	One unopened carton of tiles for each type, size and color of tile installed.
Acoustical ceilings:	Furnish quantity of full-size units equal to 3.0 percent of each panel type, pattern and color installed.
Resilient flooring:	Tile Flooring and Treads: Furnish not less than 5% extra stock material and

adhesive for each type, color, pattern and size installed.
Wall Base: Furnish not less than 5% extra stock material for each type, color, style and size installed.

Carpet: One unopened container of carpet tiles for each type, size and color.

Paint: One gallon of each paint type, color, texture and sheen. Label each container with type, color, texture, sheen **and room locations** where used.

Electrical lamps/lenses: Replacement electrical lamps amounting to at least 10% (but not less than two lamps) of each type and size installed on the job, two (2) each of plastic lens type and five (5) of each ballast type.

PART 3 - EXECUTION

1..1 CLOSEOUT PROCEDURES

A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures to the Owner’s personnel:

1. Start-up.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

1..2 FINAL CLEANING

A. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

a. Remove labels that are not permanent labels.
b. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
c. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

END OF SECTION 01700

SECTION 01740 - WARRANTIES AND BONDS

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 this Section.

1..2 SUMMARY

A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

1..3 DEFINITIONS

A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1..4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

1..5 SUBMITTALS

A. Forms for special warranties are included at the end of this Section. Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or the Contractor and subcontractor, supplier or manufacturer. Submit a draft to the Owner through the Architect for approval prior to final execution.

B. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-

leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper. Include 2 hard-copies pf warranties and bonds, and 1 electronic copy on CD.

1. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the Project title or name, and the name of the Contractor.

PART 2 - PRODUCTS (not applicable).

PART 3 - EXECUTION

1..1 SCHEDULE OF WARRANTIES

A. Schedule: Provide warranties and bonds on products and installations as specified in the following Sections:

Asphalt Shingles:	Section 07311 -	Asphalt Shingles
Slate Roofing Shingles:	Section 07322 -	Slate Roofing Shingles
Preformed Roofing and Siding:	Section 07410 -	Preformed Roofing and Siding
TPO Roofing	Section 07511 -	TPO Roofing
Built-up Asphalt Roofing	Section 07512 -	Built-up Asphalt Roofing
Insulated Translucent Skyroof System	Section 07810 -	Insulated Translucent Skyroof System
Flush Wood Doors:	Section 08211 -	Flush Wood Doors
Sectional Overhead Door and Operator:	Section 08360 -	Sectional Overhead Doors (motorized)
Aluminum Windows:	Section 08520 -	Aluminum Windows
Sliding Entry Doors:	Section 08711 -	Controlling Hardware
Insulating Glass:	Section 08800 -	Glass and Glazing
Loading Dock:	Section 11160 -	Loading Dock Equipment
Water Heaters:	Section 15480 -	Water Heaters
Packaged Heating and Cooling Units:	Section 15736 -	Packaged Heating and Cooling Units
Sliding Entrance Doors	Section 08711 -	Controlling Hardware

END OF SECTION 01740

APPENDIX A-1 – SUBSURFACE INVESTIGATION FOR PLEASANT GROVE

The Subsurface investigations, prepared by others, have been included for information only. See the following pages for the Subsurface Investigations.

Gordon Spilker Huber
Geotechnical Consultants, Inc.

REPORT
GEOTECHNICAL STUDY
PROPOSED PLEASANT GROVE LIQUOR STORE
NORTHEAST CORNER OF THE INTERSECTION OF
PLEASANT GROVE BOULEVARD AND
SAM WHITE LANE (700 SOUTH)
PLEASANT GROVE, UTAH
DFCM PROJECT NO. 68545-08225030

Submitted To:

State of Utah - DFCM
% Frank N. Murdock Jr Architect & Associates
975 East 100 South, Suite 100
Salt Lake City, Utah 84102

Submitted By:

Gordon Spilker Huber Geotechnical Consultants, Inc.
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123

March 3, 2009

Job No. 0128-032-08

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

March 3, 2009
Job No. 0128-032-08

State of Utah - DFCM
% Frank N. Murdock Jr Architect & Associates
975 East 100 South, Suite 100
Salt Lake City, Utah 84102

Attention: Mr. Frank Murdock

Gentlemen:

Re: Report
Geotechnical Study
Proposed Pleasant Grove Liquor Store
Northeast Corner of the Intersection of
Pleasant Grove Boulevard and
Sam White Lane (700 South)
Pleasant Grove, Utah
DFCM Project No. 68545-08225030

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical study performed at the site of the proposed liquor store, which is located at the northeast corner of Pleasant Grove Boulevard and Sam White Lane (700 South) in Pleasant Grove, Utah. The general location of the site with respect to major topographic features and existing facilities, as of 1994 and 1998, is presented on Figure 1, Vicinity Map. An aerial map of the site and surrounding properties is also provided as Figure 2, Area Map. A more detailed layout of the site showing existing and proposed facilities is presented on Figure 3, Site Plan. The locations of the borings drilled in conjunction with this study are presented on Figure 3.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of our study were planned in discussions between Mr. Frank Murdock of Frank N. Murdock Jr Architect & Associates, and Mr. Bill Gordon of Gordon Spilker Huber Geotechnical Consultants, Inc. (GSH).

In general, the objectives of this study were to:

1. Accurately define and evaluate the subsurface soil and groundwater conditions across the site.

2. Provide appropriate foundation, earthwork, and pavement recommendations and geoseismic information to be utilized in the design and construction of the proposed structure.

In accomplishing these objectives, our scope has included the following:

1. A field program consisting of the drilling, logging, and sampling of five borings.

2. A laboratory testing program.

3. An office program consisting of the correlation of available data, engineering analyses, and the preparation of this summary report.

1.3 AUTHORIZATION

Authorization was provided by returning a Division of Facilities and Construction Management PO Number 68545 for Project No. 68545-08225030.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the exploration borings, projected groundwater conditions, and the layout and design data discussed in Section 2., Proposed Construction, of this report. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The proposed facility will consist of an approximately 11,000 square foot one-level structure of block and light steel-frame construction with associated pavements. A loading/unloading zone will be constructed off of the southeast corner of the structure. The at-grade floor slab elevation is projected to be established an estimated one to two feet above existing grade to facilitate drainage and access. Layout of the proposed facility is shown on Figure 3.

Loads associated with the structure will be transmitted through the perimeter bearing walls and isolated columns to the supporting foundations. At this time, we project that the maximum wall and column loads will be on the order of 3 to 4 kips per lineal foot and 20 to 40 kips, respectively. Floor slab loads will range from light (average uniform loading of 100 to 150 pounds per square foot) to moderate (average uniform loading of 200 to 250 pounds per square foot).

Site development will require a minimal amount of earthwork in the form of site grading. Maximum site grading cuts are anticipated to be less than one foot. Maximum additional site grading fills are anticipated to be on the order of one to two feet.

Pavements for roadways and parking will also be a part of the overall development.

3. SITE INVESTIGATIONS

3.1 FIELD PROGRAM

In order to define and evaluate the subsurface soil and groundwater conditions at the site, 5 borings were explored to depths ranging from 5.0 to 41.5 feet below existing grade. The borings were drilled using a truck-mounted drill rig equipped with hollow-stem augers. Locations of the borings are presented on Figure 3.

The field portion of our study was under the direct control and continual supervision of an experienced member of our geotechnical staff. During the course of the drilling operations, a continuous log of the subsurface conditions encountered was maintained. In addition, relatively undisturbed and small disturbed samples of the typical soils encountered were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural examination. These classifications have been supplemented by subsequent inspection and testing in our laboratory. Detailed graphical representation of the subsurface conditions encountered is presented on Figures 4A through 4E, Log of Borings. Soils were classified in accordance with the nomenclature described on Figure 5, Unified Soil Classification System.

A 3.25-inch outside diameter, 2.42-inch inside diameter drive sampler (Dames & Moore) was utilized in the majority of the subsurface sampling at the site. Additionally, a 2.0-inch outside diameter, 1.38-inch inside diameter drive sampler (SPT) was utilized at select locations. The blow-counts recorded on the boring logs were those required to drive the sampler 12 inches with a 140-pound hammer dropping 30 inches.

Following completion of drilling operations, one and one-quarter-inch diameter slotted PVC pipe was installed in Borings B-1 through B-3 in order to provide a means of monitoring the groundwater fluctuations.

3.2 LABORATORY TESTING

3.2.1 General

In order to provide data necessary for our engineering analyses, a laboratory testing program was performed. The program included moisture and density, partial gradation, consolidation, and chemical tests. The following paragraphs describe the tests and summarize the test data.

3.2.2 Moisture and Density Tests

To aid in classifying the soils and to help correlate other test data, moisture and density tests were performed on selected samples. The results of these tests are presented on the boring logs, Figures 4A through 4E.

3.2.3 Partial Gradation Test

To aid in classifying the granular soils, partial gradation tests were performed. Results of these tests are tabulated below:

Boring No.	Depth (feet)	Percent Passing No. 200 Sieve	Soil Classification
B-1	20.5	42.8	CL/SC
B-2	9.5	65.3	SC
B-3	13.0	5.5	SP/SM

3.2.4 Consolidation Tests

To provide data necessary for our settlement analyses, a consolidation test was performed on each of two representative samples of the silty clay soils encountered at the site. The results indicate that the finer-grained soils are slightly to moderately over-consolidated and will exhibit moderate to moderately high compressibility characteristics when loaded below the over-consolidation pressure. Detailed results of the tests are maintained within our files and can be transmitted to you, upon your request.

3.2.5 Chemical Tests

To determine if the site soils will react detrimentally with concrete, chemical tests were performed on a representative sample of the natural silty clay soils encountered in Boring B-1 at a depth of five feet below existing grade. The results of the chemical tests are tabulated on the following page.

Boring No.	Depth (feet)	pH	Total Water Soluble Sulfate (ppm)
B-1	2.5	8.05	66

4. SITE CONDITIONS

4.1 SURFACE

The site is located at the northeast corner of Pleasant Grove Boulevard and Sam White Lane (700 South) in Pleasant Grove, Utah and consists of a rectangular-shaped commercial parcel. The site has been partially developed with an asphalt concrete roadway and curb and gutter islands within the roadway area west of the proposed building, as shown on Figure 3. Located on the southeastern portion of the site is an existing, (abandoned) residential home, which appears to be constructed slab-on-grade. Trees up to approximately 40 feet in height are west of the home. A well head with garden hose spigot is located to the north of the home.

The site slopes gently to the southwest, with total estimated overall relief on the order of two to three feet. The site is bordered by a small retail center with associated pavements to the north; similar undeveloped property to the east; Sam White Lane (700 South) followed by undeveloped land to the south; and to the west by Pleasant Grove Boulevard and undeveloped land beyond.

Based on the conditions encountered within the borings, the site is blanketed with fills, as well as occasional debris. Vegetation across the site consists of ankle-high grasses and weeds up to knee height.

4.2 SUBSURFACE SOILS

The soil conditions encountered in each of the borings, to the depths penetrated, were relatively similar. The site is blanketed with approximately two and one-half to three feet of brown to dark brown gravelly and silty clay fill, with occasional cobbles and concrete debris. Unless in-place test data is available to prove otherwise, this surficial fill is considered to be non-engineered fill. Non-engineered fills will exhibit poor engineering characteristics.

Below the surficial fills at the boring locations, the subsurface soils consist primarily of silty clay with occasional layers of clayey sand/sandy clay and sand with trace to some silt to the full depths penetrated, 5.0 to 41.5 feet.

The clay soils encountered are stiff and very stiff near the surface, grading to soft near the groundwater elevation (approximately 6 feet) to approximately 12 feet. At greater depth, the silty clay grades to medium stiff to stiff. The clay soils range from moist to saturated; are brown, dark brown, and gray in color; and are slightly to moderately over-consolidated.

Layers of clayey sand/sandy clay were encountered between depths of 18.5 to 22.0 feet in Boring B-1 and between depths of 8.5 to 11.5 feet in Boring B-2. A layer of sand with trace to some silt was also encountered in Boring B-3 between 8 and 14 feet. These sand layers are loose; saturated; and brown, grayish-brown, and gray in color. Our calculations indicate that the sand layers encountered in Boring B-1 and B-3 could liquefy during the design seismic event.

In general, the upper four inches of soil were loose with an approximately one- to two-inch root mat at the surface.

The lines designating the interface between soil types on the boring logs generally represent approximate boundaries. In-situ, the transition between soil types may be gradual.

4.3 GROUNDWATER

Groundwater was measured following drilling and 19 days after. Groundwater measurements are tabulated below:

Boring No.	Groundwater Depth (feet)	
	January 31, 2009*	**February 19, 2009**
B-1	5.0	5.8
B-2	6.0	6.8
B-3	5.0	6.0
B-4	No groundwater encountered to 5.0	No PVC pipe installed
B-5	No groundwater encountered to 5.0	No PVC pipe installed

* During drilling, not stabilized.

Seasonal and longer-term groundwater fluctuations on the order of one and one-half to two feet are projected with the highest seasonal levels generally occurring during the late spring and early summer months.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

Aspects of the subsurface conditions that will affect design and construction include:

1. The surficial fills which blanket the site.

2. The potential that the "loose" sand layers encountered in Borings B-1 and B-3 at depths of 18.5 feet and 8.0 feet, respectively, could liquefy during a major seismic event. Additionally and more importantly, our analysis indicates that ground rupture could occur at the location of Boring B-3 during the design seismic event. Lateral spread is not likely to occur.

3. The moderately high groundwater table.

4. The existing residential house and well head to be demolished and abandoned.

At the boring locations, approximately two and one-half to three feet of brown to dark brown gravelly and silty clay fill with occasional cobbles and concrete debris was encountered, indicating that the entire site is blanketed with these fills. There is an existing paved roadway and multiple curbed islands on the site property directly west of the proposed building footprint, which are likely placed on these fill soils. If in-place moisture and density testing data is available indicating that these surficial fills were placed and compacted in a controlled manner, then they may be considered as structural site grading fills. If test data is not available, either during the fill placement or through subsequent testing which prove that these fill soils were placed and compacted in a controlled manor, then they are to be considered as non-engineered fills. Non-engineered fills will exhibit variable and, in some cases, poor engineering characteristics.

The results of this study show that the proposed structure may be supported upon conventional spread and continuous wall foundations. Because the loads are light to moderate, our analyses indicate that the footings may be established upon undisturbed suitable near-surface natural soils and/or structural fill extending to suitable natural soils. With depth, the soils become more compressible and lose strength; therefore, if it is proposed to establish footings more than three of four feet below existing grade, GSH must be notified.

Life safety must be provided in the event of liquefaction-related ground rupture. It is our opinion that life safety can be most economically achieved by structurally tying/interconnecting the foundation.

In the following sections, detailed discussions pertaining to earthwork, foundations, lateral resistance and pressure, floor slabs, pavements, and the geoseismic setting of the site are provided.

5.2 EARTHWORK

5.2.1 Site Preparation

Initial site preparation will consist of the demolition and removal of the existing residential structure and all associated non-engineered fills, pavements, debris, surface vegetation and root mat, root bulbs, sod, and any other deleterious materials extending out at least three feet beyond

the perimeter of the proposed building, exterior flatwork, and pavements. Based on conditions observed at the boring locations, we anticipate that the average depth of root mat stripping will be approximately two inches. Existing trees and their associated root bulbs will require deeper removal depths. Vegetation and other deleterious materials should be removed from the site.

The existing home foundation should be removed to at least 18 inches below proposed structures and 12 inches below proposed pavement areas. Any existing utilities, including the well located north of the residential structure, will need to be properly abandoned and/or relocated.

Below the proposed building, exterior flatwork, and rigid pavement areas, all non-engineered fill must be removed and replaced with structural site grading fill. Unless test data can be provided indicating that the fills blanketing the site were placed and compacted in a controlled manner, they are considered as non-engineered fills.

Non-engineered fill soils may remain in flexible pavement areas provided that they are no more than 24 inches thick; do not contain deleterious material; and the upper 12 inches are scarified, moisture prepared, and recompacted to the requirements of structural fill. As an option to recompaction, the upper 12 inches of non-engineered fill soils may be removed and replaced with granular subbase over proofrolled subgrade. However, even with proper preparation, flexible pavements established overlying non-engineered soils may encounter some long-term movements unless they are completely removed.

The surficial fills may be re-utilized as site grading fill provided they meets with the requirements for such, as stated in Section 5.2.3, Structural Fill, of this report. However, it should be noted that unless moisture control is maintained near optimum content, fine-grained soils as structural site grading fill will be very difficult to compact.

Prior to the placement of structural site grading fill, pavements, floor slabs, or footings, the exposed subgrade should be proofrolled by running moderate-weight rubber tire-mounted construction equipment uniformly over the surface at least two times. If excessively soft or otherwise unsuitable soils are encountered beneath footings, they must be completely removed. In pavement, floor slab, and outside flatwork areas, unsuitable natural soils should be removed to a maximum depth of two feet and replaced with compacted granular structural fill.

5.2.2 Excavations

Static groundwater was measured as shallow as 5.8 feet below the existing surface in Boring B-1. Temporary construction excavations in cohesive soil, not exceeding four feet in depth and above or below the groundwater table, may be constructed with near-vertical sideslopes. Temporary excavations up to eight feet deep in fine-grained cohesive soils, above or below the water table, may be constructed with sideslopes no steeper than one-half horizontal to one vertical. Excavations deeper than eight feet are not anticipated at the site.

For granular (cohesionless) soils, construction excavations above the water table, not exceeding four feet, should be no steeper than one-half horizontal to one vertical. For excavations up to eight feet, in granular soils and above the water table, the slopes should be no steeper than one horizontal to one vertical. Excavations encountering clean, loose, and/or saturated cohesionless soils will be very difficult and will require very flat sideslopes and/or shoring, bracing, and dewatering.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated.

5.2.3 Structural Fill

Structural fill is defined as all fill which will ultimately be subjected to structural loadings, such as imposed by footings, floor slabs, pavements, etc. Structural fill will be required as backfill over foundations and utilities, as site grading fill, and potentially as replacement fill below footings. All structural fill must be free of sod, rubbish, topsoil, frozen soil, and other deleterious materials.

Structural site grading fill is defined as fill placed over relatively large open areas to raise the overall grade. For structural site grading fill, the maximum particle size should generally not exceed four inches or two-thirds the thickness of the fill; although, occasional larger particles, not exceeding eight inches in diameter may be incorporated if placed randomly in a manner such that "honeycombing" does not occur and the desired degree of compaction can be achieved. The maximum particle size within structural fill placed within confined areas, such as around foundation walls, should generally be restricted to two inches.

The on-site and/or imported fine-grained soils may be utilized as structural site grading fill. However, it should be noted that the natural fine-grained soils are well above optimum moisture content and unless moisture control is maintained near optimum content, compaction of fine-grained soils as structural site grading fill will be very difficult. Additionally, fine-grained soils may be near impossible to compact during wet and cold periods of the year. Only granular soils are recommended as structural fill in confined areas, such as around foundations and within utility trenches.

Imported granular structural fill should consist of a fairly well-graded mixture of sand and gravel. The plasticity index of imported fine-grained soils must not exceed 18 percent.

To stabilize soft subgrade conditions or where structural fill is required to be placed below a level one foot above the water table at the time of construction, a mixture of coarse gravels and cobbles and/or one and one-half to two-inch gravel (stabilizing fill) should be utilized.

Non-structural site grading fill is defined as all fill material not designated as structural fill and may consist of any cohesive or granular soils not containing excessive amounts of degradable material.

5.2.4 Fill Placement and Compaction

Coarse gravel and cobble mixtures (stabilizing fill) if utilized, should be end-dumped, spread to a maximum loose lift thickness of 15 inches, and compacted by dropping a backhoe bucket onto the surface continuously at least twice. As an alternative, the fill may be compacted by passing moderately heavy construction equipment or large self-propelled compaction equipment at least twice. Subsequent fill material placed over the coarse gravels and cobbles should be placed so that the "fines" are "worked into" the voids in the underlying coarser gravels and cobbles.

All structural fill should be placed in lifts not exceeding eight inches in loose thickness. Fills beneath the area extending out at least 3 feet from the perimeter of the proposed structure must be compacted to at least 95 percent of the maximum dry density as determined by the AASHTO[1] T-180 (ASTM[2] D-1557) compaction criteria. Structural fills greater than eight feet thick are not anticipated at the site. Structural fills less than 5 feet thick, which are not beneath an area extending out at least 3 feet from the perimeter of the structure, should be compacted to at least 92 percent of the above-defined criteria. Structural fills extending outside 3 feet from the structure which are greater than 5 feet thick must be compacted to 95 percent of the above criteria.

Non-structural fill may be placed in lifts not exceeding 12 inches in loose thickness and compacted by passing construction, spreading, or hauling equipment over the surface at least twice.

5.2.5 Utility Trenches

All utility trench backfill material below structurally loaded facilities (flatwork, floor slabs, paved areas, etc.) should be placed to the same material and density requirements established for structural fill. If the surface of the backfill becomes disturbed during the course of construction, the backfill should be proofrolled and/or properly compacted prior to the construction of any exterior flatwork over a backfilled trench. Proofrolling may be performed by passing moderately loaded rubber tire-mounted construction equipment uniformly over the surface at least twice. If excessively loose or soft areas are encountered during proofrolling, they should be removed to a maximum depth of two feet below design finish grade and replaced with structural fill.

Most utility companies and City-County governments are now requiring that Type A-1a or A-1b (AASHTO Designation – basically granular soils with limited fines) soils be used as backfill over utilities. These organizations are also requiring that in public roadways, the backfill over major utilities be compacted over the full depth of fill to at least 96 percent of the maximum dry density as determined by the AASHTO T-180 (ASTM D-1557) method of compaction. We recommend that as the major utilities continue onto the site that these compaction specifications are followed.

---

1 American Association of State Highway and Transportation Officials
2 American Society for Testing and Materials

Fine-grained cohesive soils, such as the natural on-site silty clays, are not recommended for use as trench backfill.

5.3 SPREAD AND CONTINUOUS WALL FOUNDATIONS

5.3.1 Design Data

The proposed structure may be supported upon conventional spread and continuous wall foundations. The footings must be established upon undisturbed suitable near-surface natural soils and/or structural fill extending to suitable natural soils. With depth, the soils become more compressible and lose strength; therefore, if it is proposed to establish footings more than three of four feet below existing grade, GSH must be notified. For design, the following parameters are provided:

Minimum Recommended Depth of Embedment for Frost Protection	- 30 inches
Minimum Recommended Depth of Embedment for Non-frost Conditions	- 15 inches
Recommended Minimum Width for Continuous Wall Footings	- 18 inches
Minimum Recommended Width for Isolated Spread Footings	- 24 inches
Recommended Net Bearing Pressure for Real Load Conditions	- 1,500 pounds per square foot
Bearing Pressure Increase for Seismic Loading	- 50 percent

The term “net bearing pressure” refers to the pressure imposed by the portion of the structure located above lowest adjacent final grade. Therefore, the weight of the footing and backfill to lowest adjacent final grade need not be considered. Real loads are defined as the total of all dead plus frequently applied live loads. Total load includes all dead and live loads, including seismic and wind.

5.3.2 Installation

Under no circumstances should the footings be established upon soft, loose or disturbed soils, non-engineered fills, sod, rubbish, frozen soils, debris, or within ponded water. If the natural soils upon which the footings are to be established become loose or disturbed, they must be

removed and replaced with granular structural fill. If granular structural fills upon which the footings are to be established become disturbed, they should be recompacted to the requirements for structural fill.

The width of replacement fill below footings should be equal to the width of the footing plus one additional foot for each foot of fill thickness placed. For example, if the width of the footing is two feet and the thickness of the structural fill beneath the footing is one foot, the width of the structural fill at the base of the footing excavation would be a total of three feet. We recommend that footing excavations be completed with a smooth-lip bucket to reduce disturbance of the bearing subgrade soils.

5.3.3 Settlements

Maximum static settlements of foundations designed and installed in accordance with recommendations presented herein, and supporting light loads as discussed in Section 2., Proposed Construction, are anticipated to be on the order of one-quarter to one-half of an inch.

Approximately 60 percent of the quoted settlement should occur during construction.

5.4 LATERAL RESISTANCE

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of 0.40 should be utilized. Passive resistance provided by properly placed and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 300 pounds per cubic foot. Below the water table, this granular soil should be considered equivalent to a fluid with a density of 150 pounds per cubic foot.

A combination of passive earth resistance and friction may be utilized provided that the friction component of the total is divided by 1.5.

5.5 LATERAL PRESSURES

The structure is to be at-grade slab; however, there could be some four-foot high perimeter walls for loading/unloading docks or retainages, utility boxes etc., which would be subjected to lateral loads.

The lateral pressure parameters, as presented within this section, are for backfills, which will consist of drained granular soil placed and compacted in accordance with the recommendations presented herein. The lateral pressures imposed upon subgrade facilities will, therefore, be basically dependent upon the relative rigidity and movement of the backfilled structure. For active walls, such as retaining walls which can move outward (away from the backfill), granular backfill may be considered equivalent to a fluid with a density of 35 pounds per cubic foot in

computing lateral pressures. For more rigid walls, granular backfill may be considered equivalent to a fluid with a density of 45 pounds per cubic foot. The above values assume that the surface of the soil slope behind the wall is horizontal and that the granular fill within three feet of the wall will be compacted with hand-operated compacting equipment.

For seismic loading and below-grade walls up to four feet tall, a uniform pressure of 25 and 55 pounds per square foot should be added for active and more rigid walls, respectively.

5.6 FLOOR SLABS

Floor slabs within the building may be established upon properly prepared, suitable undisturbed natural soils and/or upon structural fill extending to suitable natural soils. Topsoil or non-engineered fill is not considered suitable. Due to the potential for liquefaction to occur during the design seismic event, it is recommended that the floor slab be reinforced. To provide a capillary break, it is recommended that floor slabs be directly underlain by at least four inches of "free-draining" fill, such as three-quarters- to one-inch minus clean gap-graded crushed gravel. Static settlements of lightly to moderately loaded floor slabs are anticipated to be minor.

5.7 CEMENT TYPES

Laboratory tests indicate that the site soils contain negligible amounts of water soluble sulfates. Therefore, all concrete which will be in contact with the site soils may be prepared using Type I or IA cement.

5.8 PAVEMENTS

The fine-grained fills and natural silty clay soils will exhibit poor pavement support characteristics when saturated or nearly saturated. Considering these fine-grained soils presently blanketing the site as the design subgrade soils, GSH recommends using flexible pavement. Flexible pavements may be established over the existing non-engineered fill provided that the fill is prepared as previously discussed. For rigid pavement, non-engineered fill should be removed to suitable natural soils and backfilled with structural site grading fill. The flexible pavement sections on the following page are recommended based on projected traffic conditions.

Flexible Pavements:
(Asphalt Concrete)

Parking Lots

(Light to Moderately Light Volume of Automobiles and Light Trucks
with Occasional Medium-Weight Trucks
but No Heavy-Weight Trucks)
[1 equivalent 18-kip axle loads per day]

2.5 inches	Asphalt concrete
8.0 inches	Aggregate base course*
Over	Properly prepared suitable natural soils/fills, and/or structural site grading fill extending to these soils

* The base thickness may be reduced to four inches provided that a minimum of six inches of the natural surficial clay soils are replaced with granular subbase meeting a California Bearing Ratio (CBR) of 20 percent.

Primary Roadway Areas

(Moderate Volume of Automobiles and Light Trucks
Light Volume of Medium- and Heavy-Weight Trucks)
[5 to 7 equivalent 18-kip axle loads per day]

3.0 inches	Asphalt concrete
9.0 inches	Aggregate base course*
Over	Properly prepared suitable natural soils/fills, and/or structural site grading fill extending to these soils

* The base thickness may be reduced to four inches provided that a minimum of eight inches of the natural surficial clay soils are replaced with granular subbase meeting a California Bearing Ratio (CBR) of 20 percent.

In high traffic delivery-loading/unloading areas and dumpster pads, we recommend a pavement section consisting of six and one-half inches of Portland cement concrete, four inches of

aggregate base course, over properly prepared natural subgrade or site grading structural fills extending to natural subgrade.

Rigid pavement sections are for non-reinforced Portland cement concrete. Construction of the rigid pavement should be in sections 10 to 12 feet in width with construction or expansion joints or one-quarter depth saw-cuts on no more than 12-foot centers. Saw-cuts must be completed within 24 hours of the "initial set" of the concrete and should be performed under the direction of the concrete paving contractor. The concrete should have a minimum 28-day unconfined compressive strength of 4,000 pounds per square inch and contain 6 percent ±1 percent air-entrainment.

5.9 GEOSEISMIC SETTING

5.9.1 General

Utah municipalities adopted the International Building Code (IBC) 2006 on January 1, 2007. The IBC 2006 code determines the seismic hazard for a site based upon 2002 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

The structure must be designed in accordance with the procedure presented in Section 1613, Earthquake Loads, of the IBC 2006 edition to provide life safety.

5.9.2 Faulting

Based upon our review of available literature, no active faults are known to pass through or immediately adjacent to the site. The nearest active fault is the Wasatch fault approximately two miles east of the site. The Wasatch fault zone is considered capable of generating earthquakes as large as magnitude 7.3[3].

5.9.3 Soil Class

Loose, saturated sand soils were encountered in Borings B-1 and B-3 at depths of 18.5 feet and 8.0 feet, respectively. Based on our analysis, these loose, saturated sand layers will liquefy during a major seismic event (see Section 5.9.5, Liquefaction).

According to the IBC 2006 Table 1613.5.2, "Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils..." are designated under site Class F. Based on the IBC 2006 code when the soil designation falls under Class F, a site-specific spectral response

[3] Arabasz, W.J., Pechmann, J.C., and Brown, E.D., 1992, Observational seismology and the evaluation of earthquake hazards and risk in the Wasatch Front area, Utah, in Gori, P.L., and Hays, W.W., eds., Assessment of regional earthquake hazards and risk along the Wasatch Front, Utah: U.S. Geological Survey Professional Paper 1500-D, 36 p.

study is required. However, based on the American Society of Civil Engineers (ASCE) 7.05 publication, referenced in IBC Tables 1613.5.3 (1-2) Note b, the type of structure proposed, which is projected to have a structure period of less than 0.5 seconds, (to be confirmed by the project structural engineer), the acceleration values for Site Class D may be utilized. Additionally, it is believed that the structure can be adequately designed to provide life safety. Acceleration values for Site Class D are provided below.

5.9.4 Ground Motions

The IBC 2006 code is based on 2002 USGS mapping, which provides values of short and long period accelerations for the Site Class B-C boundary for the Maximum Considered Earthquake (MCE). This Site Class B-C boundary represents a hypothetical bedrock surface and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for a MCE event and incorporates a soil amplification factor for a Site Class D soil profile in the second column. Based on the site latitude and longitude (40.3557 degrees north and 111.7628 degrees west, respectively), the values for this site are tabulated below:

Spectral Acceleration Value, T Seconds	Site Class B-C Boundary [mapped values] (% g)	Site Class D [adjusted for site class effects] (% g)
Peak Ground Acceleration	47.3	48.6
0.2 Seconds, (Short Period Acceleration)	$S_S = 118.3$	$S_{MS} = 121.5$
1.0 Seconds (Long Period Acceleration)	$S_1 = 49.8$	$S_{M1} = 74.7$

The IBC 2006 code design accelerations (S_{DS} and S_{D1}) are based on multiplying the above accelerations (adjusted for site class effects) for the MCE event by two-thirds (⅔).

5.9.5 Liquefaction

The site is located in an area that has been identified by the Utah Earthquake Preparedness Information Center Utah Division of Comprehensive Emergency Management for Utah County as having “high” liquefaction potential. Liquefaction is defined as the condition when saturated, loose, granular soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. Clayey soils, even if saturated, will not liquefy during a major seismic event.

As previously discussed, layers of loose, saturated sand soils were encountered between depths of 18.5 feet and 21.5 feet in Boring B-1 and between depths of 8 feet and 14 feet in Boring B-3.

Our analysis indicates that these loose saturated sand soils would liquefy under the design seismic event. Under the present conditions, the maximum anticipated settlement resulting from the liquefaction, excluding surface rupture, would be on the order of one and one-quarter inches. However, and more importantly, this analysis indicates that surface rupture at the location of Boring B-3 could occur. This could jeopardize the structural integrity of the site structures. At the very minimum, building structures should be designed to provide life safety during such an event. It is our opinion that life safety can be most economically achieved by structurally tying/interconnecting the foundation.

Lateral spread is not anticipated to occur at the site during the design seismic event due to the lack of a continuous potential liquefaction layer, as well as the relatively level nature of the site.

It should be noted that distortion in soil beddings was not observed within the soil samples obtained from the site. The area has experienced at least three plus 7-magnitude earthquakes over the last 10,000 to 15,000 years.

Calculations performed used the procedures described in NCEER-97-0022 entitled, "Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils," and only apply to the saturated cohesionless deposits.

5.10 SITE OBSERVATIONS

As previously mentioned, up to as much as three feet of non-engineered fill soils was encountered at the boring locations and appears to blanket much of the site. Therefore, we recommend that a qualified geotechnical engineer or his representative observe the foundation excavations to identify that the non-engineered fill soils have been removed and that suitable natural soils have been encountered.

We appreciate the opportunity of providing this service for you. If you have any questions or require additional information, please do not hesitate to contact us.

Respectfully submitted,

GSH Geotechnical Consultants, Inc.

Bryan N. Roberts, State of Utah No. 276476
Professional Engineer

Reviewed by:

William J. Gordon, State of Utah No. 146417
Professional Engineer

BNR/WJG:sn

Encl. Figure 1, Vicinity Map
Figure 2, Area Map
Figure 3, Site Plan
Figures 4A through 4E, Log of Borings
Figure 5, Unified Soil Classification System

Addressee (3 + email)
c: Mr. Jim Russell (1 + email)
State of Utah – DFCM
4110 State Office Building, Suite 4110
Salt Lake City, Utah 84114

STATE OF UTAH - DFCM
JOB NO. 0128-032-08

SCALE IN FEET
1000 0 1000 2000

FIGURE 1
VICINITY MAP

REFERENCE:
USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAP
TITLED "PELICAN POINT, UTAH" DATED 1999
AND "OREM, UTAH" DATED 1994

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

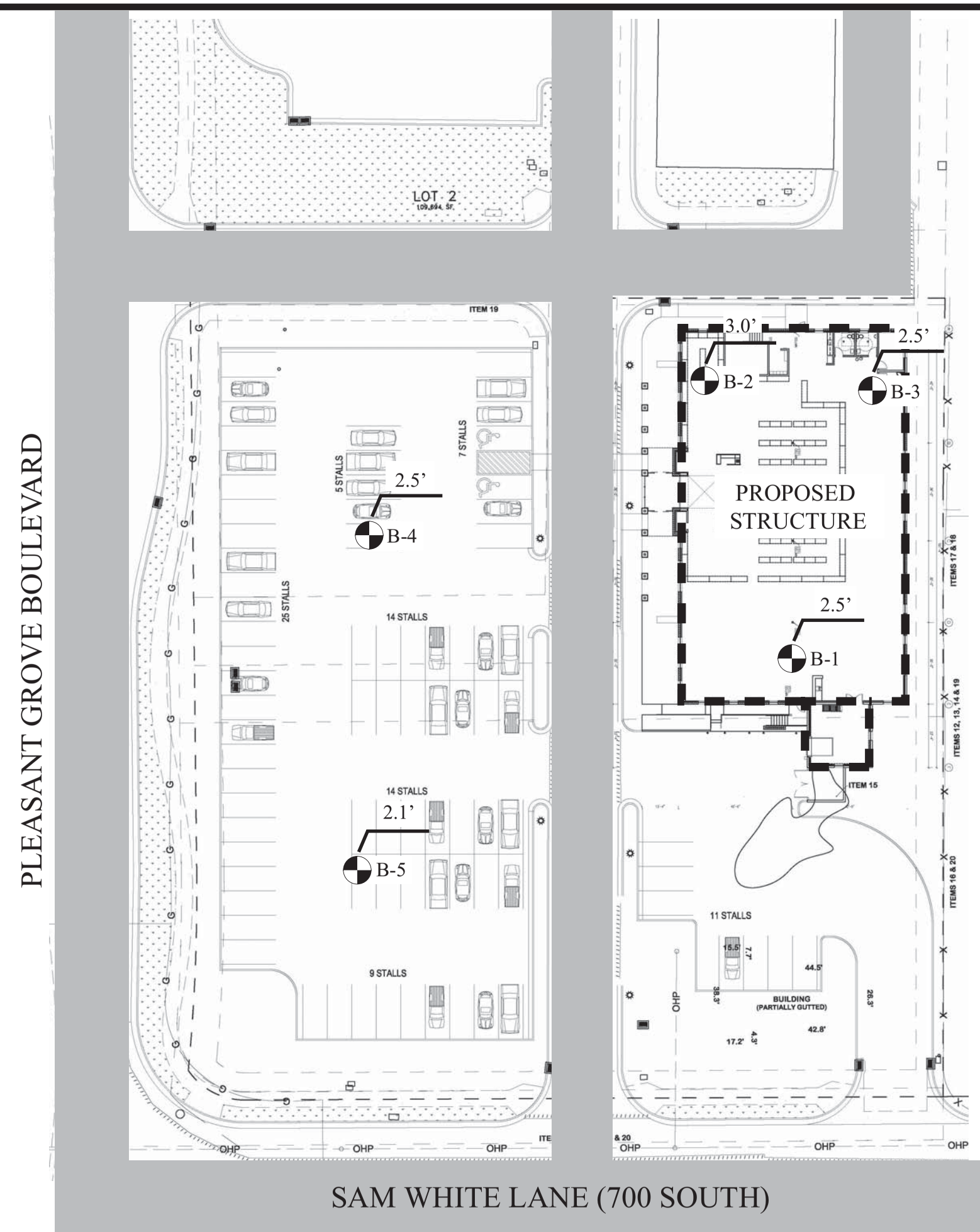
STATE OF UTAH - DFCM
JOB NO. 0128-032-08

REFERENCE:
ADAPTED FROM AERIAL PHOTOGRAPH
GOOGLE EARTH 2009

FIGURE 2
AREA MAP

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

STATE OF UTAH - DFCM
JOB NO. 0128-032-08



KEY:

#.#' Depth of Fill

Existing Asphalt Pavement

Approximate Scale: 1" = 41'

REFERENCE:
ADAPTED FROM DRAWING ENTITLED
"NEW PLEASANT GROVE LIQUOR STORE, AS101"
BY FRANK N. MURDOCK, DATED NOVEMBER 2008

FIGURE 3
SITE PLAN

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Pleasant Grove Liquor Store
Project No.: 0128-032-08
Location: Pleasant Grove Blvd/Sam White Ln, Pleasant Grove
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 01-30-09
GSH Field Rep.: RJG
Elevation: Overall Site Approximately 4521' to 4524' +/-
Water Level: 5.0' (01-30-09) 5.8' (02-19-09)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface									
		MEDIUM TO COARSE GRAVELLY CLAY, FILL with some fine to coarse sand; major roots (topsoil) to 2"; dark brown (GC-FILL)	0								loose to 4" moist "loose"
		SILTY CLAY with occasional to trace fine and coarse gravel; dark brown (CL)		14							moist stiff
		grades with some fine sand; grayish-brown with oxidation mottling	5	3		31.4		91			saturated soft
		grades with occasional layers up to 1" thick of silty fine sand; grayish-brown with oxidation	10	4							
		grades with occasional layers up to 4" thick of silty fine sand; brown with oxidation mottling	15	14							stiff
		CLAYEY SAND/SANDY CLAY fine sand; brown and grayish-brown (SC/CL)	20	6		25.3	42.8				saturated loose/ medium stiff
		SILTY CLAY with some fine sand; gray to dark gray (CL)	25								saturated medium stiff

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 4A

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Pleasant Grove Liquor Store
Project No.: 0128-032-08
Location: Pleasant Grove Blvd/Sam White Ln, Pleasant Grove
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 01-30-09
GSH Field Rep.: RJG
Elevation: Overall Site Approximately 4521' to 4524' +/-
Water Level: 5.0' (01-30-09) 5.8' (02-19-09)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		grades with some fine sand; gray and dark gray		9							
			30								very stiff
		grades gray and brownish-gray with dark gray mottling		42							
			35								stiff
		grades gray		17							
			40								
				17							
		Stopped drilling at 40.0'.									
		Stopped sampling at 41.5'.									
		Installed 1-1/4" diameter slotted PVC pipe to 41.5'.	45								
			50								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 4A
(con't)

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Pleasant Grove Liquor Store
Project No.: 0128-032-08
Location: Pleasant Grove Blvd/Sam White Ln, Pleasant Grove
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 01-30-09
GSH Field Rep.: RJG
Elevation: Overall Site Approximately 4521' to 4524' +/-
Water Level: 6.0' (01-30-09) 6.8' (02-19-09)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY CLAY, FILL with some fine to coarse sand, some fine and coarse gravel, and occasional cobble; major roots (topsoil) to 1"; brown (CL-FILL)									loose to 4" moist loose
		SILTY CLAY with some fine sand, fine gravel and 1/4" thick fine to coarse sand seams; brown (CL)		31							moist very stiff
			5								
	▼	grades with trace organics; brown and dark brown with oxidationg mottling		5		33.3		86			saturated soft
		CLAYEY SAND brown (SC)	10	4		27.6	65.3				saturated soft/loose
		SILTY CLAY brown with oxidation mottling (CL)									saturated medium stiff
			15	11							
		Stopped drilling at 14.0'. Stopped sampling at 15.5'. Installed 1-1/4" diameter slotted PVC pipe to 15.5'.	20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 4B

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Pleasant Grove Liquor Store
Project No.: 0128-032-08
Location: Pleasant Grove Blvd/Sam White Ln, Pleasant Grove
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 01-30-09
GSH Field Rep.: RJG
Elevation: Overall Site Approximately 4521' to 4524' +/-
Water Level: 5.0' (01-30-09) 6.0' (02-19-09)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY CLAY, FILL with some fine and coarse gravel and fine to coarse sand; major roots (topsoil) to 1"; brown (CL-FILL)									loose to 4" moist "loose"
		SILTY CLAY with some fine sand and trace organics and gravel; dark brown (CL)		26							moist very stiff
		grades no gravel	5	5		22.1		95			saturated soft
		FINE TO COARSE SAND with some fine and coarse gravel and trace to some silt; gray (SP/SM)		24							saturated loose
			10								
		grades silty fine sand with occasional fine and coarse gravel		2		16.4	5.5				
		SILTY CLAY with some fine sand; brown with oxidation (CL)	15								saturated medium stiff
		Stopped drilling at 13.0'.									
		Stopped sampling at 14.5'.									
		Installed 1-1/4" diameter slotted PVC pipe to 14.5'.	20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 4C

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Pleasant Grove Liquor Store
Project No.: 0128-032-08
Location: Pleasant Grove Blvd/Sam White Ln, Pleasant Grove
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 01-30-09
GSH Field Rep.: RJG
Elevation: Overall Site Approximately 4521' to 4524' +/-
Water Level: No groundwater encountered (01-30-09)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY CLAY, FILL with some fine and coarse gravel; major roots (topsoil) to 2"; dark brown (CL-FILL)									loose to 4" moist "loose"
		SILTY CLAY with some fine sand; dark brown (CL)									moist "stiff"
			5								
		Stopped drilling at 5.0'.									
		Stopped sampling at 5.0'.									
		No groundwater encountered at time of drilling.									
			10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 4D

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Pleasant Grove Liquor Store
Project No.: 0128-032-08
Location: Pleasant Grove Blvd/Sam White Ln, Pleasant Grove
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 01-30-09
GSH Field Rep.: RJG
Elevation: Overall Site Approximately 4521' to 4524' +/-
Water Level: No groundwater encountered (01-30-09)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY CLAY, FILL with some fine and coarse gravel; major roots (topsoil) to 1"; dark brown (CL-FILL)									loose to 4" moist "loose"
		SILTY CLAY with some fine sand; dark brown (CL)									moist "stiff"
			5								
		Stopped drilling at 5.0'.									
		Stopped sampling at 5.0'.									
		No groundwater encountered at time of drilling.									
			10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 4E

UNIFIED SOIL CLASSIFICATION SYSTEM

FIELD IDENTIFICATION PROCEDURES				GRAPH SYMBOL	LETTER SYMBOL [1]	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS More than half of material is larger than No. 200 sieve size. [2] (The No. 200 sieve size is about the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.		GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).		GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.
	SANDS More than half of coarse fraction is smaller than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.		SW	Well graded sands, gravelly sands, little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.		SP	Poorly graded sands, gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		SM	Silty sands, poorly graded sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).		SC	Clayey sands, poorly graded sand-clay mixtures.

IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No. 40 SIEVE SIZE		DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT)	GRAPH SYMBOL	LETTER SYMBOL [1]	TYPICAL DESCRIPTIONS
FINE GRAINED SOILS More than half of material is smaller than No. 200 sieve size. (The No. 200 sieve size is about the smallest particle visible to the naked eye)	SILTS AND CLAYS Liquid limit less than 50	None to slight	Quick to slow	None		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sand with slight plasticity.
		Medium to high	None to very slow	Medium		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		Slight to medium	Slow	Slight		OL	Organic silts and organic silt-clays of low plasticity.
	SILTS AND CLAYS Liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		High to very high	None	High		CH	Inorganic clays of high plasticity, fat clays.
		Medium to high	None to very slow	Slight to medium		OH	Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS		Readily identified by color, odor, spongy feel and frequently by fibrous texture.				Pt	Peat and other highly organic soils.

[1] Boundary classifications: –Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW–GC, well graded gravel–sand mixture with clay binder.
[2] All sieve sizes on this chart are U.S. standard.

GENERAL NOTES

1. In general, Unified Soil Classification Designations presented on the logs were evaluated by visual methods only. There rore, actual designations (based on laboratory testing) may differ.

2. Lines seperating strata on the logs represent approximate boundaries only Actual transitions may be gradual.

3. Logs represent general soil conditions observed at teh point of exploration onthe date indicated.

4. No warranty is provided as to the continuity of soil conditions between individual sample locations.

FINE - GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	TORVANE UNDRAINED SHEAR STRENGTH (tsf)	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches by Thumb. Squeezes through fingers.
Soft	2 - 4	0.125 - 0.25	0.25 - 0.5	Easily penetrated 1 " by Thumb . Molded by light finger pressure.
Medium Stiff	4 - 8	0.25 - 0.5	0.5 - 1.0	Penetrated over 1/2 " by Thumb with moerate effort. Molded by strong finger pressure.
Stiff	8 - 15	0.5 - 1.0	1.0 - 2.0	Indented about 1/2 " by Thumb but penetrated only with great effort
Very Stiff	15 - 30	1.0 - 2.0	2.0 - 4.0	Readily indented by Thumbnail
Hard	>30	>2.0	>4.0	Indented with difficulty by Thumbnail

LOG KEY SYMBOLS

- Bulk / Bag Sample
- Thin Wall
- Standard Penetration Split Spoon Sampler
- No Recovery
- Rock Core
- 3-3/4" ID D&M Sampler
- 3" ID D&M Sampler
- Water Level
- California Sampler

COARSE -GRAINDE SOIL

APPERENT DENSITY	SPT (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
Very Loose	<4	0 - 15	Easily penetrated with 1/2 " reinforcing rod pushed by hand
Loose	4 - 10	15 - 35	Difficult to penetrated with 1/2 " reinforcing rod pushed by hand
Medium Dense	10 - 30	35 - 65	Easily penetrated a foot with 1/2 " reinforcing rod driven with 5-lb hammer
Dense	30 - 50	65 - 85	Difficult to penetrated a foot with 1/2 " reinforcing rod driven with 5-lb hammer
Very Dense	>50	85 - 100	Penetrated only a few inches with 1/2 " reinforcing rod driven with 5-lb hammer

STRATIFICATION

DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2 "
LAYER	1/2 - 12 "

DESCRIPTION	THICKNESS
Occasional	One or less per foot of thickness
Frequent	More than on per foot of thichness

CEMENTATION

DESCRIPTION	DESCRIPTION
Weakely	Crumbles or breaks with handling of slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumbles or breaks with finger pressure

MODIFIERS

DESCRIPTION	%
Trace	<5
Some	5 - 12
With	>12

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible water, usually soil below Water Table

FIGURE 5

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

APPENDIX A-2 – SUBSURFACE INVESTIGATION FOR PLEASANT GROVE

The Subsurface investigations, prepared by others, have been included for information only. See the following pages for the Subsurface Investigations.

Gordon Spilker Huber
Geotechnical Consultants, Inc.

REPORT
GEOTECHNICAL STUDY
PROPOSED HEBER LIQUOR STORE
260 EAST AND ONE BLOCK SOUTH OF
1200 SOUTH STREET
(LOT 3 - HEBER GATEWAY PLAZA)
HEBER, UTAH
DFCM PROJECT NO. 68544-08224030

Submitted To:

State of Utah - DFCM
% Frank N. Murdock Jr Architect & Associates
975 East 100 South, Suite 100
Salt Lake City, Utah 84102

Submitted By:

Gordon Spilker Huber Geotechnical Consultants, Inc.
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123

March 2, 2009

Job No. 0128-031-08

Gordon Spilker Huber
Geotechnical Consultants, Inc.

March 2, 2009
Job No. 0128-031-08

State of Utah - DFCM
% Frank N. Murdock Jr Architect & Associates
975 East 100 South, Suite 100
Salt Lake City, Utah 84102

Attention: Mr. Frank Murdock

Gentlemen:

Re: Report
Geotechnical Study
Proposed Heber Liquor Store
260 East and One Block South of 1200 South Street
(Lot 3 - Heber Gateway Plaza)
Heber, Utah
DFCM Project No. 68544-08224030

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our detailed geotechnical study performed at the site of the proposed liquor store, which is located at 260 East and one block south of 1200 South Street (Lot 3 - Heber Gateway Plaza), in Heber, Utah. The general location of the site with respect to major topographic features and existing facilities, as of 1998 and 1999, is presented on Figure 1, Vicinity Map. A more detailed layout of the site showing existing and proposed facilities and site topography is presented on Figure 2, Site Plan. The locations of the borings drilled in conjunction with this study are also presented on Figure 2.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of our study were planned in discussions between Mr. Frank Murdock of Frank N. Murdock Jr Architect & Associates, and Mr. Bill Gordon of Gordon Spilker Huber Geotechnical Consultants, Inc. (GSH).

Gordon Spilker Huber Geotechnical Consultants, Inc.
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123
Tel: (801) 685-9190 Fax: (801) 685-2990
www.gshgeotech.com

In general, the objectives of this study were to:

1. Accurately define and evaluate the subsurface soil and groundwater conditions across the site.

2. Provide appropriate foundation, earthwork, and pavement recommendations and geoseismic information to be utilized in the design and construction of the proposed structure.

In accomplishing these objectives, our scope has included the following:

1. A field program consisting of the drilling, logging, and sampling of five borings.

2. A laboratory testing program.

3. An office program consisting of the correlation of available data, engineering analyses, and the preparation of this summary report.

1.3 AUTHORIZATION

Authorization was provided by returning a Division of Facilities and Construction Management PO Number 68544 for Project No. 68544-08224030.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the exploration borings, projected groundwater conditions, and the layout and design data discussed in Section 2., Proposed Construction, of this report. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The proposed facility will consist of an approximately 11,000 square foot one-level structure of block and light steel-frame construction with pavements on the east, west, and north sides of the structure. A loading/unloading zone will be constructed off the southwest corner of the structure. Layout of the proposed facility is shown on Figure 2.

Loads associated with the structure will be transmitted through the perimeter bearing walls and isolated columns to the supporting foundations. At this time, we project that the maximum wall and column loads will be on the order of 3 to 4 kips per lineal foot and 30 to 50 kips, respectively. Floor slab loads will range from light (average uniform loading of 100 to 150 pounds per square foot) to moderate (average uniform loading of 200 to 250 pounds per square foot).

Site development will require a minimal amount of earthwork in the form of site grading. We estimate that maximum cuts and fills to achieve design grades will be on the order of one to two feet.

Pavements for roadways and parking will also be a part of the overall development.

3. SITE INVESTIGATIONS

3.1 FIELD PROGRAM

In order to define and evaluate the subsurface soil and groundwater conditions at the site, 5 borings were explored to depths ranging from 5 to 19 feet below existing grade. Auger refusal was encountered within very dense gravels between depths of 9 and 19 feet in Borings B-1 through B-3. The borings were drilled using an all-terrain drill rig equipped with hollow-stem augers. Locations of the borings are presented on Figure 2.

The field portion of our study was under the direct control and continual supervision of an experienced member of our geotechnical staff. During the course of the drilling operations, a continuous log of the subsurface conditions encountered was maintained. In addition, relatively undisturbed and small disturbed samples of the typical soils encountered were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural examination. These classifications have been supplemented by subsequent inspection and testing in our laboratory. Detailed graphical representation of the subsurface conditions encountered is presented on Figures 3A through 3E, Log of Borings. Soils were classified in accordance with the nomenclature described on Figure 4, Unified Soil Classification System.

A 3.25-inch outside diameter, 2.42-inch inside diameter drive sampler (Dames & Moore) was utilized in the majority of the subsurface sampling at the site. Additionally, a 2.0-inch outside diameter, 1.38-inch inside diameter drive sampler (SPT) was utilized at select locations. The blow-counts recorded on the boring logs were those required to drive the sampler 12 inches with a 140-pound hammer dropping 30 inches.

Following completion of drilling operations, one and one-quarter-inch diameter slotted PVC pipe was installed in Borings B-1 through B-3 in order to provide a means of future monitoring the groundwater fluctuations within the depths penetrated.

3.2 LABORATORY TESTING

3.2.1 General

In order to provide data necessary for our engineering analyses, a laboratory testing program was completed. The program included moisture and density, partial gradation, Atterberg limits, consolidation, and chemical tests. The following paragraphs describe the tests and summarize the test data.

3.2.2 Moisture and Density Tests

To aid in classifying the soils and to help correlate other test data, moisture and density tests were performed on selected undisturbed samples. The results of these tests are presented on the boring logs, Figures 3A through 3E.

3.2.3 Partial Gradation Test

To aid in classifying the granular soils, a partial gradation test was performed. Results of the test are tabulated below:

Boring No.	Depth (feet)	Percent Passing No. 200 Sieve	Soil Classification
B-3	15.0	6.4	GP-GC

3.2.4 Atterberg Limits Tests

To aid in classification, an Atterberg limits test was performed on each of three samples of the surficial fine-grained cohesive soils. Results of the tests are tabulated below:

Boring No.	Depth (feet)	Liquid Limit (percent)	Plastic Limit (percent)	Plasticity Index (percent)	Soil Classification
B-1	2.0	27	19	8	CL
B-2	2.5	54	18	36	CH
B-5	1.5	61	21	40	CH

3.2.5 Consolidation Test

To provide data necessary for our settlement analyses, a consolidation test was performed upon a representative sample of the fine-grained high plastic clay soils encountered near the surface at the site. The results of the test show that the high plastic clay soils are moderately-highly to

highly over-consolidated and will exhibit moderately low compressibility characteristics when loaded below the pre-consolidation pressure. This sample tested also exhibited swell pressure (greater than 3,000 pounds per square foot) when saturated. This swell is related to both stress relief and mineralogy when saturated. Detailed results of the test are maintained within our files and can be transmitted to you, upon your request.

3.2.6 Chemical Tests

To determine if the site soils will react detrimentally with concrete, chemical tests were performed on a representative sample of the silty clay soils encountered in Boring B-2 at a depth of two and one-half feet below existing grade. The results of the chemical tests are tabulated below:

Boring No.	Depth (feet)	pH	Total Water Soluble Sulfate (ppm)
B-2	2.5	7.5	<10

4. SITE CONDITIONS

4.1 SURFACE

The site is located at 260 East and one block south of 1200 South Street (Lot 3 - Heber Gateway Plaza), in Heber, Utah. The site consists of a square shaped, undeveloped parcel, which is bounded by a new asphalt concrete paved street (Gateway Drive) to the north with additional vacant parcels beyond followed by 1200 South Street. An access roadway (260 East) runs north-south from 1200 South to site property. The site is bound to the east and west by similar vacant property and to the south by the Heber City/Wasatch Canal, which is approximately 15 feet wide by 5 feet deep and was partially full during the site work. Beyond the canal, there is an existing one-extended-level, slab-on-grade warehouse and power substation.

The site slopes gently down to the northwest with an overall relief on the order of three feet. Vegetation across the site consists of ankle- to knee-high weeds and grasses. The site was covered with approximately two feet of snow at the time of the field work.

4.2 SUBSURFACE SOIL AND GROUNDWATER

The soil conditions encountered in each of the borings, to the depths penetrated, were relatively similar. The upper two to four feet consist of silty and high plastic clay with trace fine sand and fine gravel. The upper six inches have a loose structure with approximately two inches of topsoil (root mat) at the surface. Additionally, the upper one foot contained frost. Below the surface loose zone, the surficial clay layer is moist, very stiff to hard, brown and dark brown, and

moderately-highly over-consolidated. The high plastic clays exhibit high swell pressures when saturated. The swell potential is related both to stress relief and mineralogy when saturated.

Below the surficial clay layer, granular soils comprised of sand and gravel with trace to some cobbles and varying fines content was encountered to the full depth penetrated, 5 to 19 feet. Auger refusal was encountered within very dense gravels with trace to some cobbles in Borings B-1 through B-3 at depths between 9 and 19 feet. These granular soils were moist, medium dense to very dense, brown, and will exhibit moderately high strength and moderately low compressibility characteristics.

Groundwater was not encountered in any of the borings at the time of the field work. Very high seasonal and longer-term groundwater fluctuations are projected with the highest seasonal levels generally occurring during the late spring and summer months when the Heber City/Wasatch Canal is full. During the late spring and summer months, groundwater could be within five to eight feet of grade.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

A large portion of the surficial fine-grained soils, ranging in depth between two and four feet at the boring locations, consist of moderately-highly to highly over-consolidated clays, which also exhibit a moderately high swell pressure (greater than 3,000 pounds per square foot) when saturated. The swell potential is related both to stress relief and mineralogy when saturated. This swell potential could affect spread foundations, floor slabs, exterior flatwork, and pavements.

The proposed structure can be supported upon conventional spread and continuous wall foundations established upon the natural granular soils encountered within the borings at two to four feet below the surface or on non-expansive structural fill extending to the natural granular soils.

In floor slab and critical outside flatwork areas, the entire sequence of the surficial high plastic clay soils should also be removed and replaced with non-expansive structural site grading fill. The surficial clay soils may remain below pavements if properly prepared. Flexible pavements are recommended over rigid pavements if placed over these clay soils.

Auger refusal was encountered between depths of 9 and 19 feet below the existing surface in Borings B-1 through B-3. These borings are located within the proposed building footprint. Though groundwater was not encountered within the borings to the depths penetrated, 5 to 19 feet, high seasonal groundwater fluctuations are expected. During the late spring and summer months, groundwater could be within five to eight feet of grade.

In the following sections, detailed discussions pertaining to earthwork, foundations, lateral resistance and pressure, floor slabs, pavements, and the geoseismic setting of the site are provided.

5.2 EARTHWORK

5.2.1 Site Preparation

Site preparation will initially consist of the removal of the surface vegetation, topsoil (root mat), and other deleterious materials, from beneath an area extending out at least three feet beyond the perimeter of the proposed building, exterior flatwork, and pavements. Based on conditions observed at the boring locations, we anticipate that the average depth of topsoil stripping will be approximately two inches. Surface vegetation and other deleterious materials should be removed from the site. Topsoil, although unsuitable for utilization as structural fill, may be stockpiled for subsequent landscaping purposes.

A large portion of the surficial fine-grained soils ranging in depth between two and four feet within the borings consist of a high plastic clay which is moderately-highly to highly over-consolidated and exhibits moderate expansion with moderately high swell pressures (greater than 3,000 pounds per square foot) when saturated. Due to the potential moderate expansion, it is our recommendation that the surficial clay soils be completely removed below spread footings, floor slabs, and critical outside flatwork areas. The surficial clay soils may remain below pavements if properly prepared. Flexible pavements can better tolerate swell-related movements and are recommended over rigid pavements.

Proper preparation will consist of scarification of the upper nine inches, moisture preparation to within 1 to 2 percent above optimum, and recompaction to the requirements of structural fill. As an option to recompaction, the upper nine inches of surficial clay soils may be removed, the exposed subgrade proofrolled, and replaced with granular subbase.

Subsequent to the above operations and prior to the placement of footings, structural site grading fill, or floor slabs, the exposed natural subgrade must be proofrolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If excessively soft or otherwise unsuitable soils are encountered beneath footings, they must be completely removed. In pavement, floor slab, and outside flatwork areas, unsuitable natural soils should be removed to a maximum depth of two feet and replaced with compacted granular structural fill.

5.2.2 Excavations

Groundwater was not encountered at the site to the depths penetrated, 5 to 19 feet. However, excavations near the Heber City/Wasatch Canal located along the south perimeter of the site are projected to experience higher localized groundwater fluctuations. Groundwater depths of six to eight feet are projected during the late spring and summer months.

Temporary construction excavations in cohesive soil, not exceeding four feet in depth and above or below the groundwater table, may be constructed with near-vertical sideslopes. Temporary excavations up to eight feet deep in fine-grained cohesive soils, above or below the water table, may be constructed with sideslopes no steeper than one-half horizontal to one vertical. Excavations deeper than eight feet are not anticipated at the site.

For granular (cohesionless) soils, construction excavations above the water table, not exceeding four feet, should be no steeper than one-half horizontal to one vertical. For excavations up to eight feet, in granular soils and above the water table, the slopes should be no steeper than one horizontal to one vertical. Excavations encountering clean, loose and/or saturated cohesionless soils will be very difficult and will require very flat sideslopes and/or shoring, bracing, and dewatering.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated.

5.2.3 Structural Fill

Structural fill is defined as all fill which will ultimately be subjected to structural loadings, such as imposed by footings, floor slabs, pavements, etc. Structural fill will be required as backfill over foundations and utilities, as site grading fill, and in some areas, replacement fill below footings. All structural fill must be free of sod, rubbish, topsoil, frozen soil, and other deleterious materials.

Structural site grading fill is defined as fill placed over fairly large open areas to raise the overall site grade. For structural site grading fill, the maximum particle size should generally not exceed four inches; although, occasional larger particles, not exceeding eight inches in diameter, may be incorporated if placed randomly in a manner such that “honeycombing” does not occur and the desired degree of compaction can be achieved. The maximum particle size within structural fill placed within confined areas, such as wall backfill, should generally be restricted to two inches.

The natural fine-grained soils are not recommended for structural site grading fill. However the natural granular soils may be re-utilized as structural site grading fill if they meet the requirements for such. Only granular soils are recommended as structural fill in confined areas, such as around foundations and within utility trenches.

Imported granular structural fill should consist of a fairly well-graded mixture of sand and gravel. The plasticity index of imported fine-grained soils must not exceed 18 percent. It should be noted that unless moisture control is maintained near optimum content, utilization of fine-grained soils as structural site grading fill will be very difficult to compact. Additionally, fine-grained soils may be near impossible to compact during wet and cold periods of the year.

Low frost susceptible structural fill should consist of sandy gravels with less than 10 percent fines content.

Non-structural site grading fill is defined as all fill material not designated as structural fill and may consist of any cohesive or granular soils not containing excessive amounts of degradable material.

5.2.4 Fill Placement and Compaction

All structural fill should be placed in lifts not exceeding eight inches in loose thickness. Fills beneath the area extending out at least 3 feet from the perimeter of the proposed structure must be compacted to at least 95 percent of the maximum dry density as determined by the AASHTO[1] T-180 (ASTM[2] D-1557) compaction criteria. Structural fills greater than eight feet thick are not anticipated at the site. Structural fills less than 5 feet thick, which are not beneath an area extending out at least 3 feet from the perimeter of the structure, should be compacted to at least 92 percent of the above-defined criteria. Structural fills extending outside 3 feet from the structure which are greater than 5 feet thick must be compacted to 95 percent of the above criteria.

Preparation of subgrade soils is discussed in Section 5.2.1, Site Preparation.

Non-structural fill may be placed in lifts not exceeding 12 inches in loose thickness and compacted by passing construction, spreading, or hauling equipment over the surface at least twice.

5.2.5 Utility Trenches

All utility trench backfill material below structurally loaded facilities (flatwork, floor slabs, roads, etc.) should be placed at the same density requirements established for structural fill. If the surface of the backfill becomes disturbed during the course of construction, the backfill should be proofrolled and/or properly compacted prior to the construction of any exterior flatwork over a backfilled trench. Proofrolling may be performed by passing moderately loaded rubber tire-mounted construction equipment uniformly over the surface at least twice. If excessively loose or soft areas are encountered during proofrolling, they should be removed to a maximum depth of two feet below design finish grade and replaced with structural fill.

Most utility companies and City-County governments are now requiring that Type A-1a or A-1b (AASHTO Designation – basically granular soils with limited fines) soils be used as backfill over utilities. These organizations are also requiring that in public roadways the backfill over major utilities be compacted over the full depth of fill to at least 96 percent of the maximum dry density as determined by the AASHTO T-180 (ASTM D-1557) method of compaction.

The natural fine-grained cohesive soils are not recommended for use as trench backfill. Granular soils as previously discussed should be used.

---

1 American Association of State Highway and Transportation Officials
2 American Society for Testing and Materials

5.3 SPREAD AND CONTINUOUS WALL FOUNDATIONS

5.3.1 Design Data

The proposed structure may be supported upon conventional spread and continuous wall foundations established on the natural granular soils or on granular structural fill extending to natural granular soils. For design, the following parameters are provided with respect to the projected loading discussed in Section 2., Proposed Construction, of this report:

Minimum Recommended Depth of Embedment for Frost Protection	- 30 inches
Minimum Recommended Depth of Embedment for Non-frost Conditions	- 15 inches
Recommended Minimum Width for Continuous Wall Footings	- 18 inches
Minimum Recommended Width for Isolated Spread Footings	- 24 inches
Recommended Net Bearing Pressure for Real Load Conditions	- 3,000 pounds per square foot*
Bearing Pressure Increase for Seismic Loading	- 50 percent

* For all footings supported on the natural granular soils or granular structural fill extending to the natural granular soils.

The term "net bearing pressure" refers to the pressure imposed by the portion of the structure located above lowest adjacent final grade. Therefore, the weight of the footing and backfill to lowest adjacent final grade need not be considered. Real loads are defined as the total of all dead plus frequently applied live loads. Total load includes all dead and live loads, including seismic and wind.

5.3.2 Installation

Under no circumstances should the footings be established upon soft, loose or disturbed soils, the surficial potentially moderately expansive clay soils, non-engineered fills, sod, rubbish, frozen soils, debris, or within ponded water. If the natural or replacement granular soils upon which the footings are to be established become loose or disturbed, they must be recompacted to the requirements for structural fill.

The width of the replacement fill below footings should be equal to the width of the footing plus one additional foot for each foot of fill thickness placed. For example, if the width of the footing is two feet and the thickness of the structural fill beneath the footing is one foot, the width of the structural fill at the base of the footing excavation would be a total of three feet.

It is recommend that footing excavations be completed with a smooth-lip bucket to reduce disturbance of the bearing subgrade soils.

5.3.3 Settlements

Maximum settlements of foundations designed and installed in accordance with recommendations presented herein and supporting maximum anticipated loads as discussed in Section 2., Proposed Construction, are anticipated to be on the order of one-quarter to one-half of an inch.

Approximately 60 percent of the quoted settlement should occur during construction.

5.4 LATERAL RESISTANCE

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of 0.45 should be utilized. Passive resistance provided by properly placed and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 300 pounds per cubic foot. Below the water table, this granular soil should be considered equivalent to a fluid with a density of 150 pounds per cubic foot.

A combination of passive earth resistance and friction may be utilized provided that the friction component of the total is divided by 1.5.

5.5 LATERAL PRESSURES

The structure is to be at-grade slab; however, there could be some four-foot high perimeter walls for loading/unloading docks or retainages, utility boxes etc., which would be subjected to lateral loads.

The lateral pressure parameters, as presented within this section, are for backfills, which will consist of drained granular soil placed and compacted in accordance with the recommendations presented herein. The lateral pressures imposed upon subgrade facilities will, therefore, be basically dependent upon the relative rigidity and movement of the backfilled structure. For active walls, such as retaining walls which can move outward (away from the backfill), granular backfill may be considered equivalent to a fluid with a density of 35 pounds per cubic foot in computing lateral pressures. For more rigid walls, granular backfill may be considered equivalent to a fluid with a density of 45 pounds per cubic foot. The above values assume that

the surface of the soil slope behind the wall is horizontal and that the granular fill within three feet of the wall will be compacted with hand-operated compacting equipment.

For seismic loading and below-grade walls up to four feet tall, uniform pressures of 15 and 35 pounds per square foot should be added for active and more rigid walls, respectively.

5.6 FLOOR SLABS AND EXTERIOR FLATWORK

Because of the high plastic clay soils extending to depths of two to four feet which exhibit moderate swell potential, we recommend that beneath the floor slabs and critical outside flatwork areas adjacent to the building, such as entrances and aprons, the entire sequence of the surficial high plastic clay soils be removed and replaced with structural site grading fill.

Where outside flatwork can tolerate some upward movement on the order of one-half to five-eighths of an inch, as much as 12 inches of surficial high plastic clays may remain provided that they are properly prepared and the slabs are directly supported on 12 inches of non-plastic granular structural replacement fill. Below frost protected slabs this would consist of a low permeable granular structural fill containing at least 20 percent fines. For structural fill below exterior slabs, a low frost-susceptible structural replacement fill should be utilized. It is further recommended that the slabs supported over the natural clay soils be reinforced with a minimum No. 4 rebar spaced on two-foot centers each way and be allowed to float (not be structurally tied to the building structure). To provide a capillary break, it is recommended that a vapor barrier be placed beneath inside floor slabs.

Settlements of floor slabs should be negligible.

5.7 CEMENT TYPES

Laboratory tests indicate that the site soils contain negligible amounts of water soluble sulfates. Therefore, all concrete which will be in contact with the site soils may be prepared using Type I or IA cement.

5.8 PAVEMENTS

The natural fine-grained soils will exhibit poor pavement support characteristics when saturated or nearly saturated and can be moderately expansive. Considering the moderately expansive silty clays as the design subgrade soils, GSH recommends using flexible pavement. The flexible pavement sections based on projected traffic conditions on the following page are recommended.

Flexible Pavements:
(Asphalt Concrete)

Parking Lots

(Light to Moderately Light Volume of Automobiles and Light Trucks
with Occasional Medium-Weight Trucks
but No Heavy-Weight Trucks)
[1 equivalent 18-kip axle loads per day]

3.0 inches	Asphalt concrete
9.0 inches	Aggregate base course*
Over	Properly prepared natural subgrade soils

* If the upper nine inches of natural surficial clay soils are replaced with granular subbase meeting a California Bearing Ratio (CBR) of 20 percent, then the aggregate base course thickness may be reduced to four inches.

Primary Roadway Areas

(Moderate Volume of Automobiles and Light Trucks
Light Volume of Medium- and Heavy-Weight Trucks)
[5 to 7 equivalent 18-kip axle loads per day]

3.5 inches	Asphalt concrete
10.0 inches	Aggregate base course*
Over	Properly prepared natural subgrade soils

* If the upper nine inches of natural surficial clay soils are replaced with granular subbase meeting a California Bearing Ratio (CBR) of 20 percent, then the aggregate base course thickness may be reduced to four inches.

High traffic delivery loading/unloading areas and dumpster pads may be paved with:

6.5 inches	Portland cement concrete
4.0 inches	Aggregate base course
18.0 inches	Non-expansive, low frost susceptible granular structural fill
Over	Properly prepared natural subgrade soils

Additionally, where these slabs are supported on the natural surficial clay soil sequence, they should be reinforced.

Rigid pavement sections are for reinforced Portland cement concrete. Construction of the rigid pavement should be in sections 10 to 12 feet in width with construction or expansion joints or one-quarter depth saw-cuts on no more than 12-foot centers. Saw-cuts must be completed within 24 hours of the "initial set" of the concrete and should be performed under the direction of the concrete paving contractor. The concrete should have a minimum 28-day unconfined compressive strength of 4,000 pounds per square inch and contain 6 percent ±1 percent air-entrainment.

5.9 GEOSEISMIC SETTING

5.9.1 General

Utah municipalities adopted the International Building Code (IBC) 2006 on January 1, 2007. The IBC 2006 code determines the seismic hazard for a site based upon 2002 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

The structure must be designed in accordance with the procedure presented in Section 1613, Earthquake Loads, of the IBC 2006 edition.

5.9.2 Faulting

Based on our review of available literature, no active faults pass through or immediately adjacent to the site.

5.9.3 Soil Class

For dynamic structural analysis, the Site Class D - Stiff Soil Profile as defined in Table 1613.5.2, Site Class Definitions, of the IBC 2006 can be utilized.

5.9.4 Ground Motions

The IBC 2006 code is based on 2002 USGS mapping, which provides values of short and long period accelerations for the Site Class B-C boundary for the Maximum Considered Earthquake (MCE). This Site Class B-C boundary represents a hypothetical bedrock surface and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for a MCE event and incorporates a soil amplification factor for a Site Class D soil profile in the second column. Based on the site latitude and longitude (40.4922 degrees north and 111.4097 degrees west, respectively), the values for this site are tabulated below:

Spectral Acceleration Value, T Seconds	Site Class B-C Boundary [mapped values] (% g)	Site Class D [adjusted for site class effects] (% g)
Peak Ground Acceleration	25.9	33.2
0.2 Seconds, (Short Period Acceleration)	$S_S = 64.8$	$S_{MS} = 83.1$
1.0 Seconds (Long Period Acceleration)	$S_1 = 23.4$	$S_{M1} = 45.2$

The IBC 2006 code design accelerations (S_{DS} and S_{D1}) are based on multiplying the above accelerations (adjusted for site class effects) for the MCE event by two-thirds (⅔).

5.9.5 Liquefaction

Liquefaction is defined as the condition when saturated, loose, finer-grained sand-type soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event.

Due primarily to the dense nature of the granular soils, liquefaction potential at the site is considered low.

5.10 SITE OBSERVATIONS

As previously mentioned, potentially moderately expansive clay soils blanket the site. Therefore, we recommend that a qualified geotechnical engineer observe the foundation excavations to identify that all potentially expansive soils have been removed and that suitable soils have been encountered.

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

We appreciate the opportunity of providing this service for you. If you have any questions or require additional information, please do not hesitate to contact us.

Respectfully submitted,

GSH Geotechnical Consultants, Inc.

Bryan N. Roberts, State of Utah No. 276476
Professional Engineer

Reviewed by:

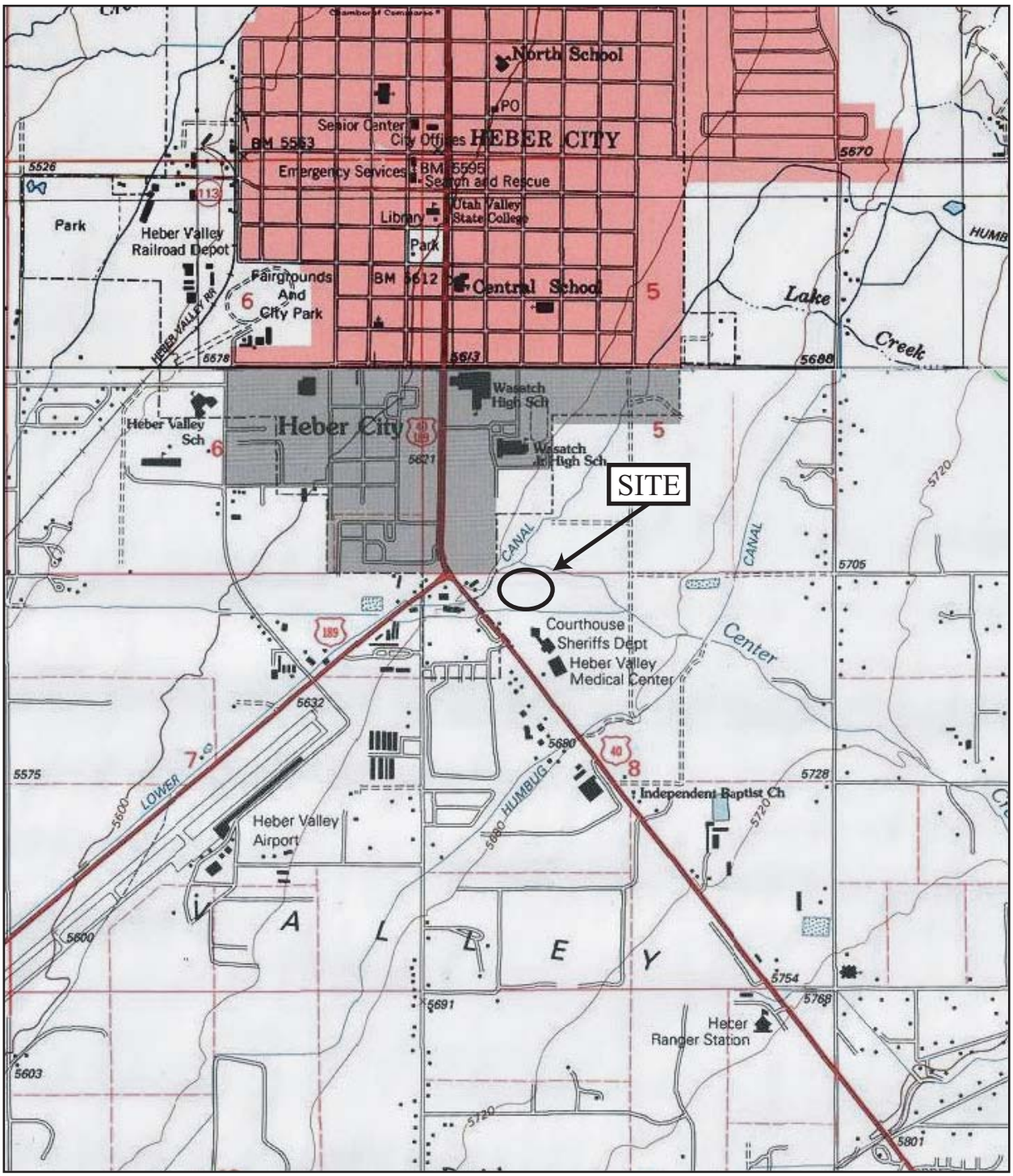
William J. Gordon, State of Utah No. 146417
Professional Engineer

BNR/WJG:sn

Encl. Figure 1, Vicinity Map
Figure 2, Site Plan
Figures 3A through 3E, Log of Borings
Figure 4, Unified Soil Classification System

Addressee (3 + email)
c: Mr. Jim Russell (1 + email)
State of Utah – DFCM
4110 State Office Building, Suite 4110
Salt Lake City, Utah 84114

STATE OF UTAH - DFCM
JOB NO. 0128-031-08



SCALE IN FEET
1000 0 1000 2000

FIGURE 1
VICINITY MAP

REFERENCE:
USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAP
TITLED "CHARLESTON, UTAH" DATED 1998
AND "HEBER, UTAH" DATED 1999

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

STATE OF UTAH - DFCM
JOB NO. 0128-031-08

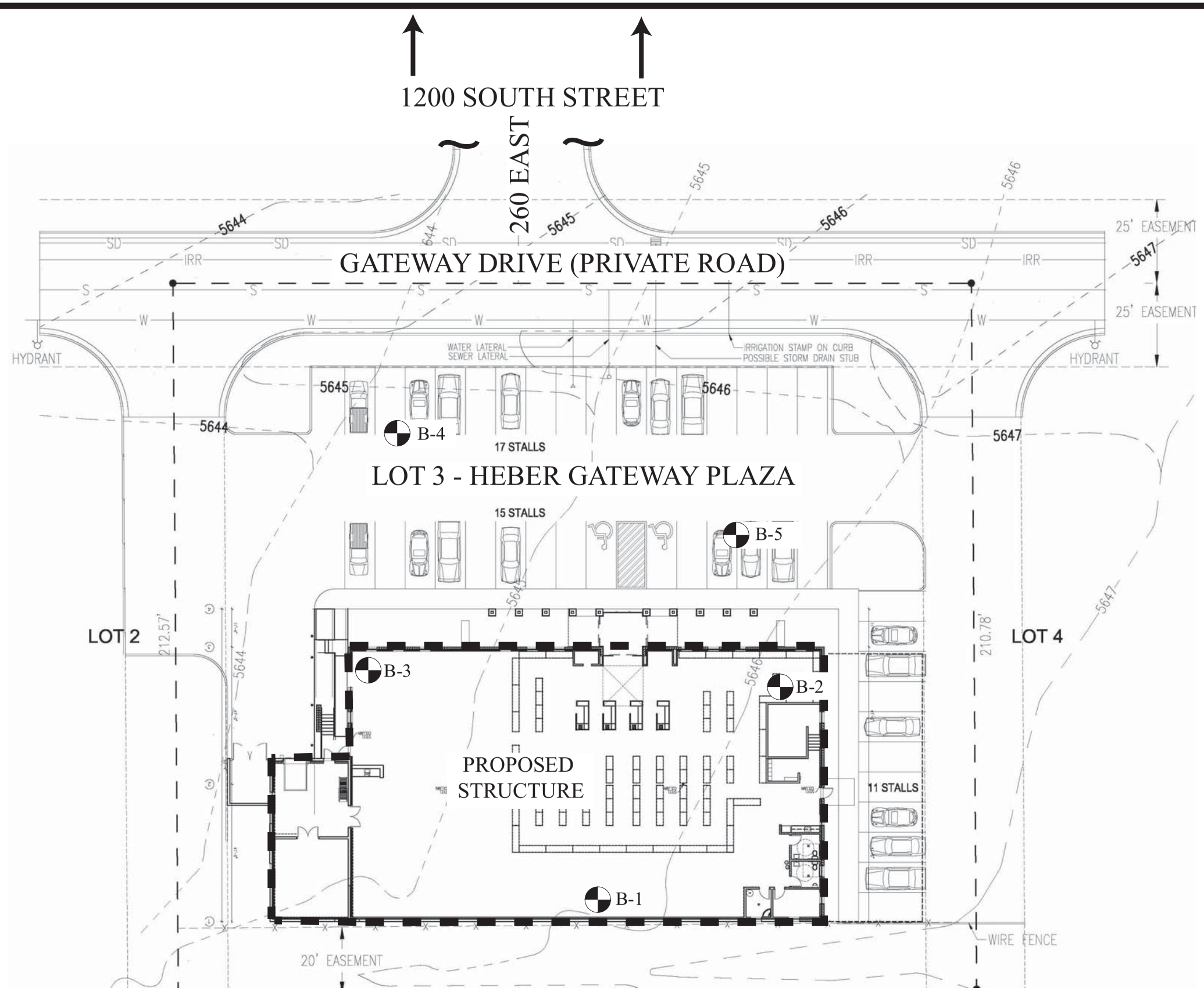


FIGURE 2
SITE PLAN

REFERENCE:
ADAPTED FROM DRAWING ENTITLED
"NEW HEBER LIQUOR STORE, AS101"
BY FRANK N. MURDOCK, JR. ARCHITECTS AND ASSOCIATES
DATED NOV. 2008

APPROXIMATELY SCALE: 1" = 33'

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Heber Liquor Store
Project No.: 0128-031-08
Location: Appx 260 E & S of 1200 S, Heber City, Utah
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 01-30-09
GSH Field Rep.: PRE
Elevation: 5646' +/-
Water Level: No groundwater encountered (01-30-09)
Remarks: Datum: See Figure 2

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY CLAY with trace fine sand and fine gravel; major roots (topsoil) to 2"; brown (CL)									loose structure to 6" moist hard
				64					27	19	
		SILTY FINE AND COARSE GRAVEL with some fine sand and trace to some silt; brown (GP/GM)									moist medium dense
			5	42							
		grades with some cobbles									very dense
			10	66							
		Auger refusal at 9.0'.									
		Stopped sampling at 10.5'.									
		Installed 1-1/4" diameter slotted PVC pipe to 10.5'.									
		No groundwater encountered at time of drilling.	15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3A

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Heber Liquor Store
Project No.: 0128-031-08
Location: Appx 260 E & S of 1200 S, Heber City, Utah
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 01-30-09
GSH Field Rep.: PRE
Elevation: 5646' +/-
Water Level: No groundwater encountered (01-30-09)
Remarks: Datum: See Figure 2

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		HIGH PLASTIC CLAY with trace fine sand and fine gravel; major roots (topsoil) to 2"; brown with light brown and white mottling (CH)									loose structure to 6" frozen to 10" moist hard
				100		9.2		114	54	36	
		FINE AND COARSE GRAVEL with some fine sand and trace to some silt; brown (GP/GM)									moist very dense
			5	50 1"							
		CLAYEY GRAVEL with some sand and cobbles; brown (GC)									moist very dense
			10	100 5.5"							
		FINE AND COARSE GRAVEL with some sand and trace to some silt; yellowish-brown to brown (GM/GP)									moist very dense
			15	136							
		Auger refusal at 19.0'.	20								
		Stopped sampling at 16.0'.									
		Installed 1-1/4" diameter slotted PVC pipe to 19.0'.									
		No groundwater encountered at time of drilling.									
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3B

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Heber Liquor Store
Project No.: 0128-031-08
Location: Appx 160 E & S of 1200 S, Heber City, Utah
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 01-30-09
GSH Field Rep.: PRE
Elevation: 5644.5' +/-
Water Level: No groundwater encountered (01-30-09)
Remarks: Datum: See Figure 2

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface									
		HIGH PLASTIC CLAY with trace fine sand; major roots (topsoil) to 2"; dark brown (CH)	0								loose structure to 6" frozen to 10"
		CLAYEY FINE AND COARSE GRAVEL with some fine to coarse sand and cobbles and trace to soem clay;t; brown (GP-GC)		139		3.2	6.4				moist very dense
		FINE AND COARSE GRAVEL with some fine to coarse sand and trace to some cobbles and silt; brown (GP-GM)	5	120							
		CLAYEY FINE AND COARSE GRAVEL with some sand; brown (GC)	10	50 3"							
		Auger refusal at 11.0'.									
		Stopped sampling at 9.9'.									
		Installed 1-1/4" diameter slotted PVC pipe to 11.0'.									
		No groundwater encountered at time of drilling.	15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3C

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Heber Liquor Store
Project No.: 0128-031-08
Location: Appx 260 E & S of 1200 S, Heber City, Utah
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 01-30-09
GSH Field Rep.: PRE
Elevation: 5644.5' +/-
Water Level: No groundwater encountered (01-30-09)
Remarks: Datum: See Figure 2

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface									
		SILTY CLAY with trace fine sand; brown (CL)	0								loose structure to 6" frozen to 10" moist "very stiff"
		SILTY FINE AND COARSE GRAVEL with some fine sand; brown (GM)									moist very dense
			5								
		Auger refusal at 5.0'.									
		Stopped sampling at 2.5'.									
		No groundwater encountered at time of drilling.									
			10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3D

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Heber Liquor Store
Project No.: 0128-031-08
Location: Appx 260 E & S of 1200 S, Heber City, Utah
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 01-30-09
GSH Field Rep.: PRE
Elevation: 5645.5' +/-
Water Level: No groundwater encountered (01-30-09)
Remarks: Datum: See Figure 2

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		HIGH PLASTIC CLAY with trace fine sand; dark brown (CH)									loose structure to 6" frozen to 10" moist "very stiff"
		SILTY FINE AND COARSE GRAVEL with some fine sand; brown (GM)									moist "very dense"
			5								
		Auger refusal at 5.0'.									
		Stopped sampling at 1.5'.									
		No groundwater encountered at time of drilling.									
			10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3E

UNIFIED SOIL CLASSIFICATION SYSTEM

FIELD IDENTIFICATION PROCEDURES				GRAPH SYMBOL	LETTER SYMBOL [1]	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS More than half of material is larger than No. 200 sieve size. [2] (The No. 200 sieve size is about the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.		GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).		GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.
	SANDS More than half of coarse fraction is smaller than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.		SW	Well graded sands, gravelly sands, little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.		SP	Poorly graded sands, gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		SM	Silty sands, poorly graded sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).		SC	Clayey sands, poorly graded sand-clay mixtures.

IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No. 40 SIEVE SIZE		DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT)	GRAPH SYMBOL	LETTER SYMBOL [1]	TYPICAL DESCRIPTIONS
FINE GRAINED SOILS More than half of material is smaller than No. 200 sieve size. (The No. 200 sieve size is about the smallest particle visible to the naked eye)	SILTS AND CLAYS Liquid limit less than 50	None to slight	Quick to slow	None		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sand with slight plasticity.
		Medium to high	None to very slow	Medium		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		Slight to medium	Slow	Slight		OL	Organic silts and organic silt-clays of low plasticity.
	SILTS AND CLAYS Liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		High to very high	None	High		CH	Inorganic clays of high plasticity, fat clays.
		Medium to high	None to very slow	Slight to medium		OH	Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS		Readily identified by color, odor, spongy feel and frequently by fibrous texture.				Pt	Peat and other highly organic soils.

[1] Boundary classifications: –Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW–GC, well graded gravel–sand mixture with clay binder.
[2] All sieve sizes on this chart are U.S. standard.

GENERAL NOTES

1. In general, Unified Soil Classification Designations presented on the logs were evaluated by visual methods only. There rore, actual designations (based on laboratory testing) may differ.

2. Lines seperating strata on the logs represent approximate boundaries only Actual transitions may be gradual.

3. Logs represent general soil conditions observed at teh point of exploration onthe date indicated.

4. No warranty is provided as to the continuity of soil conditions between individual sample locations.

FINE - GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	TORVANE UNDRAINED SHEAR STRENGTH (tsf)	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches by Thumb. Squeezes through fingers.
Soft	2 - 4	0.125 - 0.25	0.25 - 0.5	Easily penetrated 1 " by Thumb . Molded by light finger pressure.
Medium Stiff	4 - 8	0.25 - 0.5	0.5 - 1.0	Penetrated over 1/2 " by Thumb with moerate effort. Molded by strong finger pressure.
Stiff	8 - 15	0.5 - 1.0	1.0 - 2.0	Indented about 1/2 " by Thumb but penetrated only with great effort
Very Stiff	15 - 30	1.0 - 2.0	2.0 - 4.0	Readily indented by Thumbnail
Hard	>30	>2.0	>4.0	Indented with difficulty by Thumbnail

LOG KEY SYMBOLS

- Bulk / Bag Sample
- Thin Wall
- Standard Penetration Split Spoon Sampler
- No Recovery
- Rock Core
- 3-3/4" ID D&M Sampler
- 3" ID D&M Sampler
- Water Level
- California Sampler

COARSE -GRAINDE SOIL

APPERENT DENSITY	SPT (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
Very Loose	<4	0 - 15	Easily penetrated with 1/2 " reinforcing rod pushed by hand
Loose	4 - 10	15 - 35	Difficult to penetrated with 1/2 " reinforcing rod pushed by hand
Medium Dense	10 - 30	35 - 65	Easily penetrated a foot with 1/2 " reinforcing rod driven with 5-lb hammer
Dense	30 - 50	65 - 85	Difficult to penetrated a foot with 1/2 " reinforcing rod driven with 5-lb hammer
Very Dense	>50	85 - 100	Penetrated only a few inches with 1/2 " reinforcing rod driven with 5-lb hammer

STRATIFICATION

DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2 "
LAYER	1/2 - 12 "

DESCRIPTION	THICKNESS
Occasional	One or less per foot of thickness
Frequent	More than on per foot of thichness

CEMENTATION

DESCRIPTION	DESCRIPTION
Weakely	Crumbles or breaks with handling of slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumbles or breaks with finger pressure

MODIFIERS

DESCRIPTION	%
Trace	<5
Some	5 - 12
With	>12

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible water, usually soil below Water Table

FIGURE 4

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

APPENDIX B – LIQUOR STORE SHELF SEISMIC ANCHORAGE (SEE ALSO DRAWING DETAIL 2/A105)

APPENDIX C-1 – FIRE FLOW TEST REPORT FOR PLEASANT GROVE

CBPE
Craig Blue, P.E. Inc.
Fire Suppression Design
Consulting & Engineering
1971 West 3300 South, #A 801-886-3473, Fax-886-3493
West Valley City, UT 84119 Craig@CBluePE.com

FIRE FLOW TEST REPORT
CBPE # 280-6
Date: 2/2/09

This report contains the assessment of the water supply available for fire protection at the following site/address:

Utah State Liquor Store
Pleasant Grove blvd & 700 South (Sam White Ln).
Pleasant Grove, Utah

Report was prepared at the direction of:
Frank Murdock
Frank N Murdock Architect & Assoc.
975 East 100 South
Salt Lake City, Utah 84102
Phone: 801-532-4441

Prepared by:
Craig Blue, P.E.

Background Information:

The purpose of this report is to determine the amount of water supply available at the site noted above. The report shall assist authorities having jurisdiction, in determining fire suppression requirements & issuing of building permits. Comments included in report, that references 2007 International Building/Fire code are based on minimum recommended standards only. The authorities having jurisdiction may require more or less than the reference appendix.

Water to site is provided by Pleasant Grove City Water District. Fire hydrants nearest to site are served by gravity feed systems using Pressure Reducing Valves to maintain reduced pressure. Per Greg Woodcox, Pleasant Grove Water Department, the system has a 10" main routed along 700 South. Also noted was no change to system pressures, or seasonal reductions occur during the year. Location of hydrants used for test are noted on drawing.

Flow Test:
The flow test was performed by Craig Blue PE Inc.. Water flow and pressures available at hydrants nearest to site are as follows:

Static Pressure: 130 psi
Residual Pressure: .. 84 psi
Flowing 2 outlets (2.5") :….2316 gpm
Reference elevation- n/a
See flow data sheet for site plan, and hydrants reference.
Fire flow calculated: 3708 gpm at 20 psi,

In accordance with Appendix table B105.1 a minimum fire flow of 2250 gpm required for the proposed (12,460 sq.ft). fire area, using type IIB noncombustible structure type. Per section B105.2 exceptions, the fire flow may be reduced 50% when fire sprinklers are provided.

With the building being provided with fire sprinkler system, the fire flow of 3708 gpm allows for a maximum fire area not to exceed 121,300 sq.ft. using type IIB noncombustible structure.

Proposed building is approximately 12,460 sq.ft. with fire sprinklers provided throughout. Fire flow to site is considered reliable and sufficient to meet the fire flow demands.

Fire Sprinkler system should be designed using a minimum 10% pressure reduction for a margin of safety and future growth in area . Reduced design data shall be as follows:

Static Pressure:	117 psi
Residual Pressure:	76 psi
Flowing :	2316 gpm

If there are further questions, please contact me
Craig Blue,P.E.

Attached:
Flow Data Sheet & Chart
Referenced IFC code sections.

FLOW TEST DATA SHEET

CBPE
Craig Blue, P.E. Inc.
Fire Suppression Design
Consulting & Engineering

1971 West 3300 South, #A
West Valley City, UT 84119

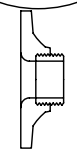
801-886-3473, Fax-886-3493
Craig@CBluePE.com

CBPE: 280-6

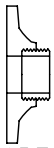
WATER SYSTEM: Pleasant Grove City Water
NAME OF PROPERTY: Utah Dept. of Alcohol Beverage Control- DABC
ADDRESS: Pleasant Grove Blvd & Sam White Ln (700 s)
Pleasant Grove, Utah
DATE: 2/2/09 TIME: 2:00 pm TEMPERATURE: +40°F
TYPE OF CITY SYSTEM: x
TEST CONDUCTED BY: Craig Blue Pe
WITNESSED BY: Dustin Frank
NOTES: x

OUTLET TYPES:

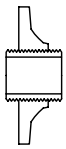
PLAY PIPE
C=0.97



SMOOTH
C=0.90



SQUARE
C=0.80



PROJECTED
C=0.70

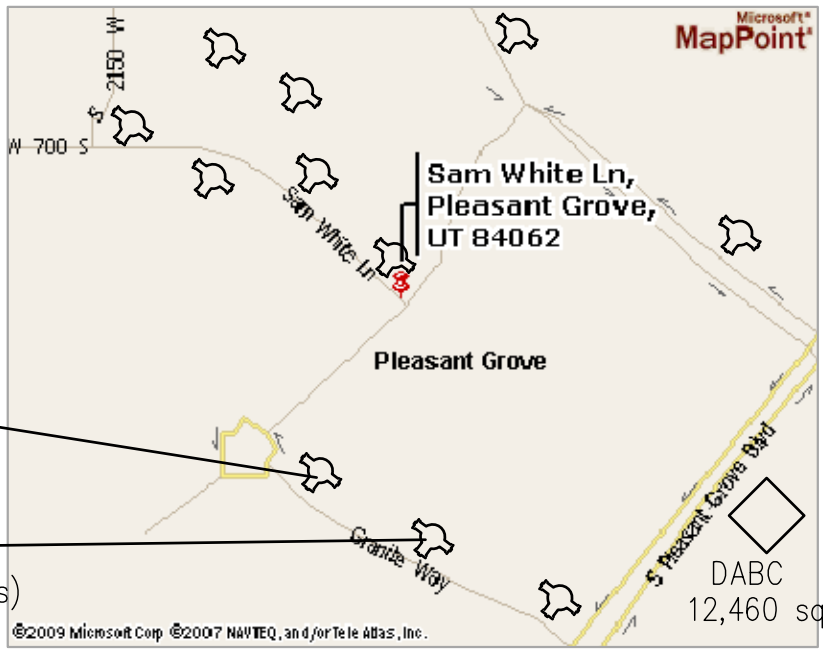
FORMULA: $Q = 29.83\ CD^2\sqrt{P}$

WHERE Q IS GALLONS PER MINUTE
C IS THE COEFFICIENT OF DISCHARGE
D IS I.D. IN INCHES OF OUTLET (2.469" typ.)
P IS PITOT GAUGE READING (PSI)

	SIZE (IN)	PITOT (PSI)	FLOW (GPM)
OUTLET 1	2.703 (DF)	30	1158
OUTLET 2	2.703 (DF)	30	1158
OUTLET 3			
OUTLET 4			
FIRE FLOW: 3708 @ 20psi		TOTAL FLOW: 2316	

STATIC: 130 PSI RESIDUAL: 84 PSI ELEVATION:

SKETCH AREA MAP BELOW: North at top of sheet



HYDRANT:
130 psi Static
84 psi Residual

HYDRANT:
30 psi pitot (2 outlets)
flowing 2316 gpm

CBPE
Craig Blue, P.E. Inc.
Fire Suppression Design
Consulting & Engineering

1971 West 3300 South, #A
West Valley City, UT 84119
801-886-3473, Fax-886-3493
Craig@CBluePE.com

FLOW TEST DATA CHART

CBPE: 280-6

WATER SYSTEM: Pleasant Grove City Water
NAME OF PROPERTY: Utah Dept. of Alcohol Beverage Control- DABC
ADDRESS: Pleasant Grove Blvd & Sam White Ln (700 s)
Pleasant Grove, Utah

SUPPLY: 130 PSI (STATIC) 84 PSI (RESIDUAL) 2316 GPM (FLOWING)

DATE OF TEST: 2/02/09

Flow test performed by Craig Blue PE & Dustin Frank

Per Water Dept. (Greg Woodcox) Hydrants near site are supplied by a 10" main along 700s. System use PRV's to reduce elevated tank system pressures.. No pressure/seasonal variation occur during season.

Per IFC 2007 edition, Table B105.1 a fire flow greater than 2250 gpm required for proposed 12,460 sq.ft. type II structure.

Water system is considered reliable and sufficient for proposed (12,460 sq.ft.) type II noncombustible structure.

Fire sprinkler system shall be designed with a minimum 10% reduction for pressures available, to provide a safety margin for future system demands.

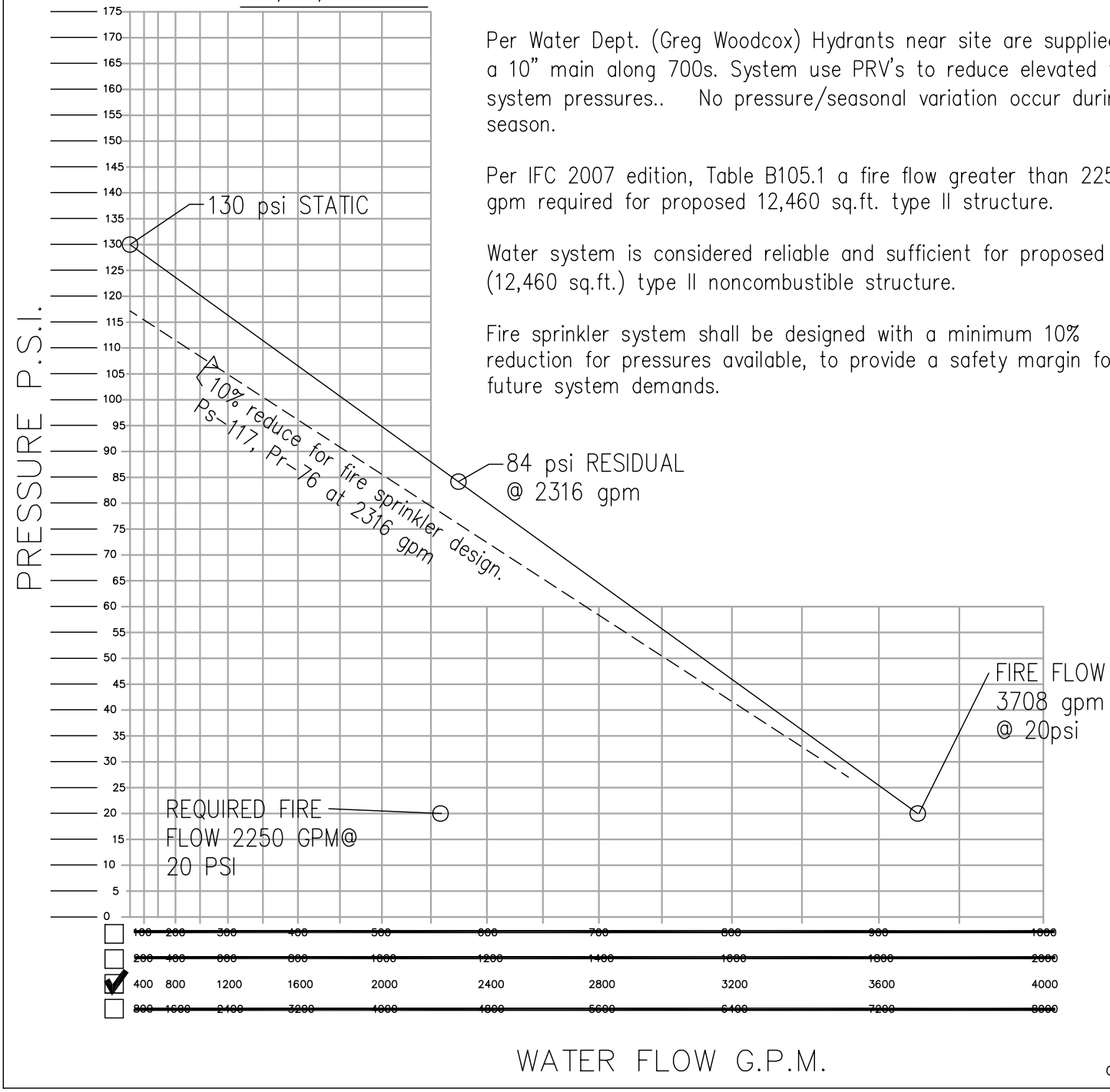


CHART #1

507.2 Shaftway markings.
Vertical shafts shall be identified as required by this section.

507.2.1 Exterior access to shaftways.
Outside openings accessible to the fire department and which open directly on a hoistway or shaftway communicating between two or more floors in a building shall be plainly marked with the word SHAFTWAY in red letters at least 6 inches (152 mm) high on a white background. Such warning signs shall be placed so as to be readily discernible from the outside of the building.

507.2.2 Interior access to shaftways.
Door or window openings to a hoistway or shaftway from the interior of the building shall be plainly marked with the word SHAFTWAY in red letters at least 6 inches (152 mm) high on a white background. Such warning signs shall be placed so as to be readily discernible.

Exception: Marking shall not be required on shaftway openings which are readily discernible as openings onto a shaftway by the construction or arrangement.

507.3 Pitfalls.
The intentional design or alteration of buildings to disable, injure, maim or kill intruders is prohibited. No person shall install and use firearms, sharp or pointed objects, razor wire, explosives, flammable or combustible liquid containers, or dispensers containing highly toxic, toxic, irritant or other hazardous materials in a manner which may passively or actively disable, injure, maim or kill a fire fighter who forcibly enters a building for the purpose of controlling or extinguishing a fire, rescuing trapped occupants or rendering other emergency assistance.

SECTION 508
FIRE PROTECTION WATER SUPPLIES

508.1 Required water supply.
An approved water supply capable of supplying the required fire flow for fire protection shall be provided to premises upon which facilities, buildings or portions of buildings are hereafter constructed or moved into or within the jurisdiction.

508.2 Type of water supply.
A water supply shall consist of reservoirs, pressure tanks, elevated tanks, water mains or other fixed systems capable of providing the required fire flow.

508.2.1 Private fire service mains.
Private fire service mains and appurtenances shall be installed in accordance with NFPA 24.

COPYRIGHT © 2006 by INTERNATIONAL CODE COUNCIL, INC.

508.2.2 Water tanks.
Water tanks for private fire protection shall be installed in accordance with NFPA 22.

508.3 Fire flow.
Fire flow requirements for buildings or portions of buildings and facilities shall be determined by an approved method.

508.4 Water supply test.
The fire code official shall be notified prior to the water supply test. Water supply tests shall be witnessed by the fire code official or approved documentation of the test shall be provided to the fire code official prior to final approval of the water supply system.

508.5 Fire hydrant systems.
Fire hydrant systems shall comply with Sections 508.5.1 through 508.5.6.

508.5.1 Where required.
Where a portion of the facility or building hereafter constructed or moved into or within the jurisdiction is more than 400 feet (122 m) from a hydrant on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains shall be provided where required by the fire code official.

Exceptions:

1. For Group R-3 and Group U occupancies, the distance requirement shall be 600 feet (183 m).
2. For buildings equipped throughout with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2, the distance requirement shall be 600 feet (183 m).

508.5.2 Inspection, testing and maintenance.
Fire hydrant systems shall be subject to periodic tests as required by the fire code official. Fire hydrant systems shall be maintained in an operative condition at all times and shall be repaired where defective. Additions, repairs, alterations and servicing shall comply with approved standards.

508.5.3 Private fire service mains and water tanks.
Private fire service mains and water tanks shall be periodically inspected, tested and maintained in accordance with NFPA 25 at the following intervals:

1. Private fire hydrants (all types): Inspection annually and after each operation; flow test and maintenance annually.

COPYRIGHT © 2006 by INTERNATIONAL CODE COUNCIL, INC.

proceedings, which shall set forth the reasons for its decisions, the vote of each member, the absence of a member and any failure of a member to vote.

A101.6 Legal counsel.
The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

A101.7 Meetings.
The board shall meet at regular intervals, to be determined by the chairman. In any event, the board shall meet within 10 days after notice of appeal has been received.

A101.8 Conflict of interest.
Members with a material or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations, and voting on such matters.

A101.9 Decisions.
Every decision shall be promptly filed in writing in the office of the fire code official and shall be open to public inspection. A certified copy shall be sent by mail or otherwise to the appellant, and a copy shall be kept publicly posted in the office of the fire code official for 2 weeks after filing.

A101.10 Procedures.
The board shall be operated in accordance with the Administrative Procedures Act of the state in which it is established or shall establish rules and regulations for its own procedure not inconsistent with the provisions of this code and applicable state law.

APPENDIX B
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

SECTION B101
GENERAL

B101.1 Scope.
The procedure for determining fire-flow requirements for buildings or portions of buildings

COPYRIGHT © 2006 by INTERNATIONAL CODE COUNCIL, INC.

hereafter constructed shall be in accordance with this appendix. This appendix does not apply to structures other than buildings.

SECTION B102
DEFINITIONS

B102.1 Definitions.
For the purpose of this appendix, certain terms are defined as follows:

FIRE-FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m^2), used to determine the required fire flow.

SECTION B103
MODIFICATIONS

B103.1 Decreases.
The fire chief is authorized to reduce the fire-flow requirements for isolated buildings or a group of buildings in rural areas or small communities where the development of full fire-flow requirements is impractical.

B103.2 Increases.
The fire chief is authorized to increase the fire-flow requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall not be more than twice that required for the building under consideration.

B103.3 Areas without water supply systems.
For information regarding water supplies for fire-fighting purposes in rural and suburban areas in which adequate and reliable water supply systems do not exist, the fire code official is authorized to utilize NFPA 1142 or the *International Wildland-Urban Interface Code.*

SECTION B104
FIRE-FLOW CALCULATION AREA

B104.1 General.
The fire-flow calculation area shall be the total floor area of all floor levels within the exterior walls, and under the horizontal projections of the roof of a building, except as modified in

COPYRIGHT © 2006 by INTERNATIONAL CODE COUNCIL, INC.

Section B104.3.

B104.2 Area separation.
Portions of buildings which are separated by fire walls without openings, constructed in accordance with the *International Building Code,* are allowed to be considered as separate fire-flow calculation areas.

B104.3 Type IA and Type IB construction.
The fire-flow calculation area of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: Fire-flow calculation area for open parking garages shall be determined by the area of the largest floor.

SECTION B105
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

B105.1 One- and two-family dwellings.
The minimum fire-flow requirements for one- and two-family dwellings having a fire-flow calculation area which does not exceed 3,600 square feet (344.5 m^2) shall be 1,000 gallons per minute (3785.4 L/min). Fire-flow and flow duration for dwellings having a fire-flow calculation area in excess of 3,600 square feet (344.5 m^2) shall not be less than that specified in Table B105.1.

Exception: A reduction in required fire flow of 50 percent, as approved, is allowed when the building is provided with an approved automatic sprinkler system.

TABLE B105.1
MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS[a]

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[c]	FLOW DURATIC (hours)
Type IA and IB[b]	Type IIA and IIIA[b]	Type IV and V-A[b]	Type IIB and IIIB[b]	Type V-B[b]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	

COPYRIGHT © 2006 by INTERNATIONAL CODE COUNCIL, INC.

APPENDIX C-2 – FIRE FLOW TEST REPORT FOR PLEASANT GROVE

CBPE
Craig Blue, P.E. Inc.
Fire Suppression Design
Consulting & Engineering

1971 West 3300 South, #A 801-886-3473, Fax-886-3493
West Valley City, UT 84119 Craig@CBluePE.com

FIRE FLOW TEST REPORT
CBPE # 280-5
Date: 2/16/09

This report contains the assessment of the water supply available for fire protection at the following site/address:

Utah State Liquor Store
262 East Gateway Drive.
Heber City, Utah

Report was prepared at the direction of:
Frank Murdock
Frank N Murdock Architect & Assoc.
975 East 100 South
Salt Lake City, Utah 84102
Phone: 801-532-4441

Prepared by:
Craig Blue, P.E.

Background Information:

The purpose of this report is to determine the amount of water supply available at the site noted above. The report shall assist authorities having jurisdiction, in determining fire suppression requirements & issuing of building permits. Comments included in report, that references 2007 International Building/Fire code are based on minimum recommended standards only. The authorities having jurisdiction may require more or less than the reference appendix.

Water to site is provided by Heber City Water District. Fire hydrants nearest to site are served by gravity feed systems using Pressure Reducing Valves to maintain reduced pressure. Per Water department, the system has an existing main routed along 1200 S, north of building site. Also noted was no change to system pressures, or seasonal reductions occur during the year. Specific location of test near site was noted at 1250 s. 100 e. north of site. Review of site plans shows future hydrant at north corners of site.

Flow Test:
The flow test was performed by Wasatch County Fire Department. Water flow and pressures available at hydrants nearest to site are as follows:

Static Pressure: 78 psi
Residual Pressure: .. 75 psi
Flowing 1 outlet (2.5") :….1300 gpm
Reference elevation- n/a
See flow data sheet for site plan, and hydrants reference.
Fire flow calculated: 6,434 gpm at 20 psi,

In accordance with Appendix table B105.1 a minimum fire flow of 2250 gpm required for the proposed (12,460 sq.ft). fire area, using type IIB noncombustible structure type. Per section B105.2 exceptions, the fire flow may be reduced 50% when fire sprinklers are provided.

Proposed building is approximately 12,460 sq.ft. with fire sprinklers provided throughout. Fire flow to site is considered reliable and sufficient to meet the fire flow demands.

Fire Sprinkler system should be designed using a minimum 10% pressure reduction for a margin of safety and future growth in area . Reduced design data shall be as follows:

Static Pressure:	71 psi
Residual Pressure:	68 psi
Flowing :	1300 gpm

If there are further questions, please contact me
Craig Blue,P.E.

Attached:
Flow Data Sheet & Chart
Referenced IFC code sections.

FLOW TEST DATA SHEET

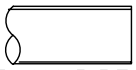
CBPE
Craig Blue, P.E. Inc.
Fire Suppression Design
Consulting & Engineering

1971 West 3300 South, #A
West Valley City, UT 84119

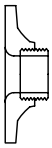
801-886-3473, Fax-886-3493
Craig@CBluePE.com

CBPE: 280-5

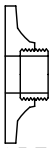
OUTLET TYPES:



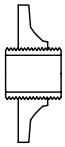
PLAY PIPE
C=0.97



SMOOTH
C=0.90



SQUARE
C=0.80



PROJECTED
C=0.70

WATER SYSTEM: Heber City Water
NAME OF PROPERTY: Utah Dept. of Alcohol Beverage Control- DABC
ADDRESS: 262 East Gateway Drive
Heber City, Utah
DATE: 1/30/09 TIME: x am TEMPERATURE: +40°F
TYPE OF CITY SYSTEM: gravity feed with PRV's.
TEST CONDUCTED BY: Wasatch County Fire Department
WITNESSED BY: Jerry Davis-Wasatch County Fire Marshal
NOTES: no seasonal pressure reductions- per Water Dept.

FORMULA: $Q = 29.83\ CD^2\sqrt{P}$

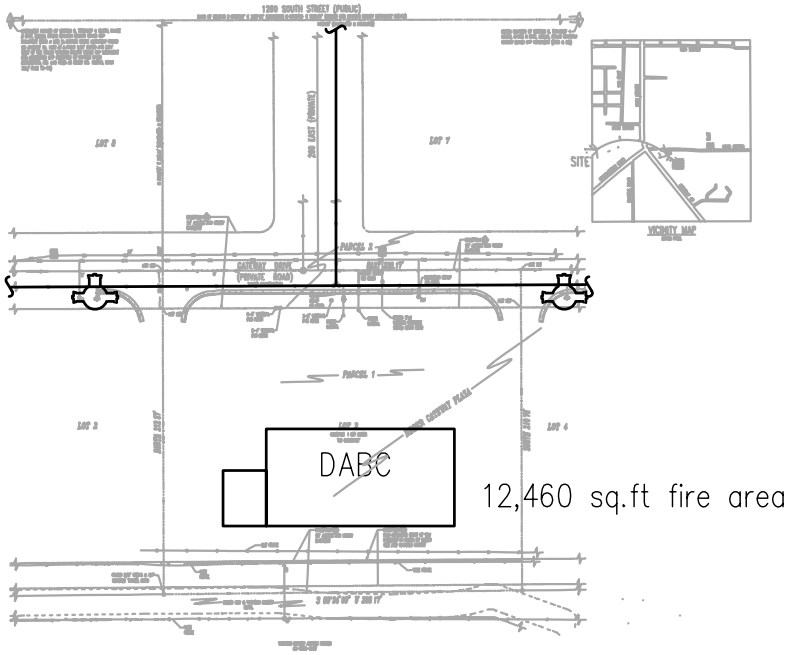
WHERE Q IS GALLONS PER MINUTE
C IS THE COEFFICIENT OF DISCHARGE
D IS I.D. IN INCHES OF OUTLET (2.469" typ.)
P IS PITOT GAUGE READING (PSI)

	SIZE (IN)	PITOT (PSI)	FLOW (GPM)
OUTLET 1	2.5	x	1300
OUTLET 2			
OUTLET 3			
OUTLET 4			
FIRE FLOW: 6434 @ 20psi		TOTAL FLOW: 1300	

STATIC: 78 PSI RESIDUAL: 75 PSI ELEVATION:

SKETCH AREA MAP BELOW:

TEST DATA PROVIDED BY WASATCH COUNTY FIRE DEPARTMENT. NO HYDRANT LOCATIONS WERE PROVIDED FOR REFERENCE. TEST NOTED AT INTERSECTION OF 1250 SOUTH & 100 E. NORTH OF SITE.



12,460 sq.ft fire area

CBPE
Craig Blue, P.E. Inc.
Fire Suppression Design
Consulting & Engineering

1971 West 3300 South, #A
West Valley City, UT 84119

801-886-3473, Fax-886-3493
Craig@CBluePE.com

FLOW TEST DATA CHART

CBPE: 280-5

WATER SYSTEM: Heber City Water
NAME OF PROPERTY: Utah Dept. of Alcohol Beverage Control- DABC
ADDRESS: 262 East Gateway Drive
Heber City, Utah

SUPPLY: 78 PSI (STATIC) 75 PSI (RESIDUAL) 1300 GPM (FLOWING)

DATE OF TEST: 1/30/09

Flow test performed by Jerry Davis, Wasatch County Fire Marshal. Per Water Dept. Hydrants near site are supplied main along 1200s. System use PRV's to reduce elevated tank system pressures. No pressure/seasonal variation occur during season.

Per IFC 2007 edition, Table B105.1 a fire flow greater than 2250 gpm required for proposed 12,460 sq.ft. type II structure.

Water system is considered reliable and sufficient for proposed (12,460 sq.ft.) type II noncombustible structure.

Fire sprinkler system shall be designed with a minimum 10% reduction for pressures available, to provide a safety margin for future system demands.

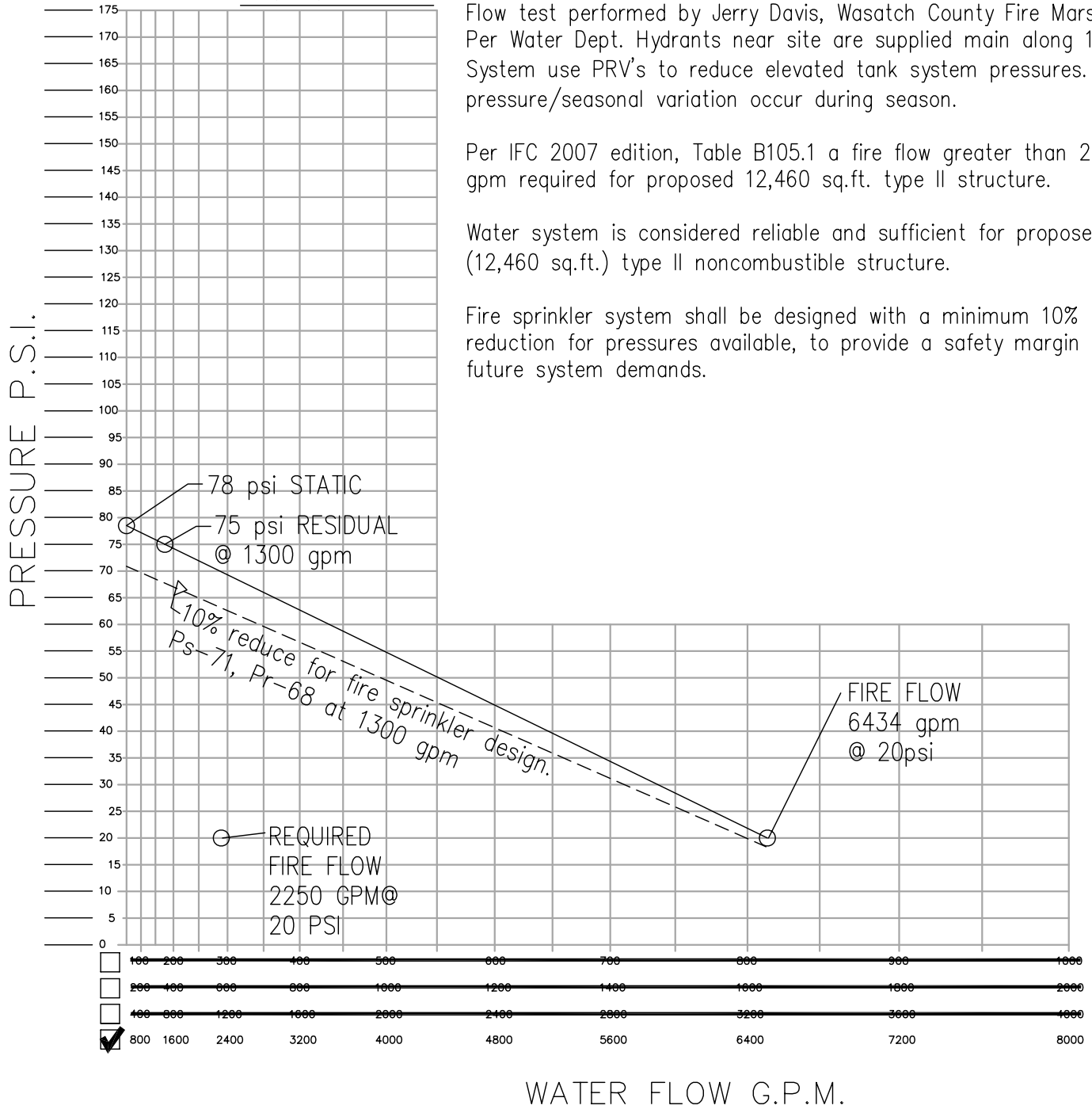


CHART #1

507.2 Shaftway markings.
Vertical shafts shall be identified as required by this section.

507.2.1 Exterior access to shaftways.
Outside openings accessible to the fire department and which open directly on a hoistway or shaftway communicating between two or more floors in a building shall be plainly marked with the word SHAFTWAY in red letters at least 6 inches (152 mm) high on a white background. Such warning signs shall be placed so as to be readily discernible from the outside of the building.

507.2.2 Interior access to shaftways.
Door or window openings to a hoistway or shaftway from the interior of the building shall be plainly marked with the word SHAFTWAY in red letters at least 6 inches (152 mm) high on a white background. Such warning signs shall be placed so as to be readily discernible.

Exception: Marking shall not be required on shaftway openings which are readily discernible as openings onto a shaftway by the construction or arrangement.

507.3 Pitfalls.
The intentional design or alteration of buildings to disable, injure, maim or kill intruders is prohibited. No person shall install and use firearms, sharp or pointed objects, razor wire, explosives, flammable or combustible liquid containers, or dispensers containing highly toxic, toxic, irritant or other hazardous materials in a manner which may passively or actively disable, injure, maim or kill a fire fighter who forcibly enters a building for the purpose of controlling or extinguishing a fire, rescuing trapped occupants or rendering other emergency assistance.

SECTION 508
FIRE PROTECTION WATER SUPPLIES

508.1 Required water supply.
An approved water supply capable of supplying the required fire flow for fire protection shall be provided to premises upon which facilities, buildings or portions of buildings are hereafter constructed or moved into or within the jurisdiction.

508.2 Type of water supply.
A water supply shall consist of reservoirs, pressure tanks, elevated tanks, water mains or other fixed systems capable of providing the required fire flow.

508.2.1 Private fire service mains.
Private fire service mains and appurtenances shall be installed in accordance with NFPA 24.

COPYRIGHT © 2006 by INTERNATIONAL CODE COUNCIL, INC.

508.2.2 Water tanks.
Water tanks for private fire protection shall be installed in accordance with NFPA 22.

508.3 Fire flow.
Fire flow requirements for buildings or portions of buildings and facilities shall be determined by an approved method.

508.4 Water supply test.
The fire code official shall be notified prior to the water supply test. Water supply tests shall be witnessed by the fire code official or approved documentation of the test shall be provided to the fire code official prior to final approval of the water supply system.

508.5 Fire hydrant systems.
Fire hydrant systems shall comply with Sections 508.5.1 through 508.5.6.

508.5.1 Where required.
Where a portion of the facility or building hereafter constructed or moved into or within the jurisdiction is more than 400 feet (122 m) from a hydrant on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains shall be provided where required by the fire code official.

Exceptions:

1. For Group R-3 and Group U occupancies, the distance requirement shall be 600 feet (183 m).
2. For buildings equipped throughout with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2, the distance requirement shall be 600 feet (183 m).

508.5.2 Inspection, testing and maintenance.
Fire hydrant systems shall be subject to periodic tests as required by the fire code official. Fire hydrant systems shall be maintained in an operative condition at all times and shall be repaired where defective. Additions, repairs, alterations and servicing shall comply with approved standards.

508.5.3 Private fire service mains and water tanks.
Private fire service mains and water tanks shall be periodically inspected, tested and maintained in accordance with NFPA 25 at the following intervals:

1. Private fire hydrants (all types): Inspection annually and after each operation; flow test and maintenance annually.

COPYRIGHT © 2006 by INTERNATIONAL CODE COUNCIL, INC.

proceedings, which shall set forth the reasons for its decisions, the vote of each member, the absence of a member and any failure of a member to vote.

A101.6 Legal counsel.
The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

A101.7 Meetings.
The board shall meet at regular intervals, to be determined by the chairman. In any event, the board shall meet within 10 days after notice of appeal has been received.

A101.8 Conflict of interest.
Members with a material or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations, and voting on such matters.

A101.9 Decisions.
Every decision shall be promptly filed in writing in the office of the fire code official and shall be open to public inspection. A certified copy shall be sent by mail or otherwise to the appellant, and a copy shall be kept publicly posted in the office of the fire code official for 2 weeks after filing.

A101.10 Procedures.
The board shall be operated in accordance with the Administrative Procedures Act of the state in which it is established or shall establish rules and regulations for its own procedure not inconsistent with the provisions of this code and applicable state law.

APPENDIX B
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

SECTION B101
GENERAL

B101.1 Scope.
The procedure for determining fire-flow requirements for buildings or portions of buildings

COPYRIGHT © 2006 by INTERNATIONAL CODE COUNCIL, INC.

hereafter constructed shall be in accordance with this appendix. This appendix does not apply to structures other than buildings.

SECTION B102
DEFINITIONS

B102.1 Definitions.
For the purpose of this appendix, certain terms are defined as follows:

FIRE-FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m^2), used to determine the required fire flow.

SECTION B103
MODIFICATIONS

B103.1 Decreases.
The fire chief is authorized to reduce the fire-flow requirements for isolated buildings or a group of buildings in rural areas or small communities where the development of full fire-flow requirements is impractical.

B103.2 Increases.
The fire chief is authorized to increase the fire-flow requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall not be more than twice that required for the building under consideration.

B103.3 Areas without water supply systems.
For information regarding water supplies for fire-fighting purposes in rural and suburban areas in which adequate and reliable water supply systems do not exist, the fire code official is authorized to utilize NFPA 1142 or the *International Wildland-Urban Interface Code.*

SECTION B104
FIRE-FLOW CALCULATION AREA

B104.1 General.
The fire-flow calculation area shall be the total floor area of all floor levels within the exterior walls, and under the horizontal projections of the roof of a building, except as modified in

COPYRIGHT © 2006 by INTERNATIONAL CODE COUNCIL, INC.

Section B104.3.

B104.2 Area separation.
Portions of buildings which are separated by fire walls without openings, constructed in accordance with the *International Building Code,* are allowed to be considered as separate fire-flow calculation areas.

B104.3 Type IA and Type IB construction.
The fire-flow calculation area of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: Fire-flow calculation area for open parking garages shall be determined by the area of the largest floor.

SECTION B105
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

B105.1 One- and two-family dwellings.
The minimum fire-flow requirements for one- and two-family dwellings having a fire-flow calculation area which does not exceed 3,600 square feet (344.5 m^2) shall be 1,000 gallons per minute (3785.4 L/min). Fire-flow and flow duration for dwellings having a fire-flow calculation area in excess of 3,600 square feet (344.5 m^2) shall not be less than that specified in Table B105.1.

Exception: A reduction in required fire flow of 50 percent, as approved, is allowed when the building is provided with an approved automatic sprinkler system.

TABLE B105.1
MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS[a]

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[c]	FLOW DURATIC (hours)
Type IA and IB[b]	Type IIA and IIIA[b]	Type IV and V-A[b]	Type IIB and IIIB[b]	Type V-B[b]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	

COPYRIGHT © 2006 by INTERNATIONAL CODE COUNCIL, INC.

DIVISION 2 - SITEWORK

Section 02200	Earthwork
Section 02230	Site Clearing
Section 02480	Landscaping and Irrigation System
Section 02510	Water Distribution
Section 02513	Asphalt Concrete Paving
Section 02520	Portland Cement Concrete Paving
Section 02530	Sanitary Sewerage
Section 02630	Storm Drainage
Section 02720	Storm Sewerage System
Section 02753	Concrete Pavement, Curbs and Sidewalks
Section 02765	Pavement Markings
Section 02831	Chain Link Fences and Gates
Section 02870	Site Furnishings

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.

1..2 SUMMARY

A. After review of site soils conditions, develop plan acceptable to Owner and Architect for methods and materials to be used for the following:

1. Preparing of subgrade for building slabs, walks, and pavements.
2. Drainage fill course for support of building slabs is included as part of this work.
3. Excavating and backfilling of trenches within building lines.
4. Excavating and backfilling for underground mechanical and electrical utilities and buried mechanical and electrical appurtenances.
5. Grading and drainage from the site, including site retention of storm water and design for removal of hydrocarbon pollutants from parking lot drainages prior to such drainage entering the storm sewers.
6. Protective drainage for stability of footings and foundations (including retaining walls)

B. Excavating and Backfilling for Mechanical/Electrical Work: Refer to Divisions 15 and 16 sections for excavation and backfill required in conjunction with underground mechanical and electrical utilities and buried mechanical and electrical appurtenances.

C. Final Grading, together with placement and preparation of topsoil for lawns and planting, is specified in Division 2 Section, "Landscaping and Irrigation System".

D. **The area under the entire building footprint and concrete maneuvering pad at the dock area shall be excavated to a depth of approximately four feet (4') below existing grade. The moisture sensitive expansive clays are to be removed from the site. Replace the expansive clays with imported engineered fill under the entire building footprint, sidewalks and the concrete maneuvering area at the loading dock. Refer to the Subsurface Investigation (Soils Report) for compaction, over excavation and engineered fill requirements. At a minimum, comply with all requirements of the Subsurface Investigation. Additional requirements such as the depth of the concrete slab reinforcing and over excavation at the sidewalks and maneuvering slab are required by these documents.**

1..3 DEFINITIONS

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

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

1. 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.

2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Architect.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify Architect and Soils Engineer, who will make an inspection of conditions. If Architect and Soils Engineer determine 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 and Soils Engineer.

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.

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

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

1..4 SUBMITTALS

A. Test Reports: Submit the following reports directly to Owner, Architect from the testing services, with copy to Contractor:

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..5 QUALITY ASSURANCE

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

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

PART 2 - PRODUCTS

1..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 with not more than 5 % 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.

F. Engineered fill and or structural fill materials: Well-graded granular (sand and/or gravel) material imported from off-site. The percentage of fines by weight passing the No. 200 sieve should be limited to 15 percent for the first 12 inches of structured fill above the stabilization base. (All imported fill must meet approval of the soils engineer.)

PART 3 - EXECUTION

1..1 EXCAVATION

A. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

1..2 STABILITY OF EXCAVATIONS

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

B. 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.

1..3 DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

1. 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.

2. 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.

1..4 STORAGE OF EXCAVATED MATERIALS

A. Stockpile excavated materials acceptable for backfill where directed. Place, grade, and shape the 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.

1..5 EXCAVATION FOR STRUCTURES

A. 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.

B. Remove existing fill materials, footings, slabs, concrete, if any, and other deleterious materials as directed by the Structural Engineer. 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.

1..6 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

1..7 BACKFILL AND FILL

A. Develop Specifications for placement and compaction of soil material for each area classification listed below, using materials specified in Part 2 of this Section.

1. Grassed areas, walks and pavements, steps, building slabs, 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.
2. 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. Use care in backfilling to avoid damage or displacement of pipe systems.

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.
5. Removal of trash and debris from excavation.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

1..8 GRADING

A. General: Develop Specifications for uniform grading of all site areas below, and include adjacent transition areas. Such that the finished work will have 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. Lawn or Unpaved Areas, Walks, Pavements, Surface of Fill under Building Slabs

1..9 PAVEMENT SUBBASE COURSE

A. Develop Specifications acceptable to the Owner for all subbase courses.

1..10 BUILDING SLAB DRAINAGE COURSE

A. Develop Specifications acceptable to the Owner for all building drainage courses.

1..11 FIELD QUALITY CONTROL

A. Develop acceptable specifications for 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..12 EROSION CONTROL

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

1..13 MAINTENANCE

A. Develop Specifications acceptable to Owner for Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

1..14 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Develop Specifications for Removal of unwanted materials from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property.

END OF SECTION 02200

SECTION 02230 - SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Cleaning site of structures, debris, grass, trees and other plant life in preparation for site or building excavation Work.
2. Protection of existing structures, trees or vegetation indicated to remain.
3. Stripping topsoil from areas indicated.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:
1. Section 01150 – Environmental Procedures: Recycling and Reuse of Waste Materials.
2. Section 02200 - Earthwork: Cutting, filling, and grading for proposed site improvements.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Obtain required permits and licenses in accordance with requirements of Federal Clean Water Act (CWA) and Water Quality Act (WQA). File Notice of Intent (NOI) with United States Environmental Protection Agency, or appropriate state agency where project is located.
2. Provide temporary erosion control systems as indicated on Drawings or as directed by Architect or Owner's Representative to protect adjacent properties and water resources from erosion and sedimentation.
3. CWA (1972) and WQA (1987) Requirements:
   a. Where Work on this project will disturb 5 or more acres, do not start Work without obtaining a "National Pollution Discharge Elimination System" (NPDES) permit governing discharge of storm water from project site for duration of Contract. Prepare and obtain approval of a "Storm Water Pollution Prevention Plan" (SWP^3) that includes monitoring of erosion control measures for duration of Contract.
   b. Provide storm water management in accordance with NPDES permit, SWP^3 and for any enforcement action taken or imposed by Federal or State agencies, including cost of fines, construction delays and remedial actions resulting from failure to comply with all provisions of NPDES permit and SWP^3.
   c. Keep SWP^3 on site and make available for inspection by appropriate authority having jurisdiction at any time.

1.3 PROJECT CONDITIONS OR SITE CONDITIONS

A. Existing Conditions:
1. Conditions existing at time of inspection during bidding will be maintained by the owner so far as practical.
2. Notify the Architect of variations to conditions or discrepancies in actual site conditions prior to start of site preparation Work.

3. Traffic: Conduct operations and removal of debris with minimum interference to roads, streets, walks, and other adjacent facilities. Do not close or obstruct streets, walks or other facilities without permission from authorities having jurisdiction.
4. Protections: Provide protection for safe passage of persons around area of site preparation. Take precautions and conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.
   a. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

PART 2 PRODUCTS

Not Used.

2.1 MATERIALS

A. Topsoil: Friable clay loam surface soil containing humus, organic matter, found in a depth of not less than 4 inches free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other unsuitable material.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Locate existing utilities as specified in Section 02200.
   2. Verify that survey benchmark and intended elevations for the Work are as indicated and are not located in an area that may be damaged.
   3. Verify that existing plant life and clearing limits are clearly tagged, identified and marked in such a manner as to insure their safety throughout construction operations.

C. Report in writing to the Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the owner.

3.2 PREPARATION

A. Provide temporary erosion control systems as indicated on Drawings or as directed by the Architect to protect project site and adjacent properties and water resources from erosion and sedimentation.

3.3 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove existing structures as shown on the site demolition plan, including all foundation walls, footings and utilities to off-site terminations as shown. Place suitable fill material in horizontal layers not exceeding 8 inches loose depth, and compact as specified herein and in Section 02200.

B. Remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of Work as indicated on Drawings. Removal includes digging out stumps and roots. Fill depressions caused by clearing and grubbing operations to subgrade elevation. Prevent water ponding. Place suitable fill material in horizontal layers not exceeding 8 inches loose depth, and compact as specified herein and in Section 02200.

C. Remove grass, trees, plant life, stumps and all other construction debris from site.

1. Collect, recycle, reuse, and dispose of demolished materials as specified in Section 01150 – Environmental Procedures.
   a. Mulch: Identify organic debris that is free of disease, pest infestation, and chemical contamination and that is suitable for recycling on site. Chip and compost suitable organic debris for use as mulch on site. Stockpile where indicated on Drawings or directed by the Architect.

3.4 TOPSOIL EXCAVATION

A. Strip topsoil from areas that are indicated to be filled, excavated, landscaped, or re-graded to depth that prevents contact with underlying subsoil or unsuitable material. Where trees are indicated to remain, stop topsoil stripping sufficient distance from tree to prevent damage to main root system.

B. Cut heavy growths of grass from areas prior to start of stripping. Remove heavy growths of grass along with clearing of other vegetation materials.

C. Topsoil: Organic surface soil found in depth not less than 6 inches.

D. Satisfactory Topsoil: Soil reasonably free of subsoil, clay lumps, stones and other objects over 2 inches in diameter, weeds, roots, and other unsuitable material.

E. Stockpile topsoil where indicated on Drawings or directed by the Architect. Construct stockpile areas to positively drain surface water. Cover stockpile areas as required to prevent windblown dust. Dispose of unsuitable topsoil off-site as specified clearing, unless directed otherwise by the Architect. Dispose of excess topsoil off-site as specified for clearing, unless directed otherwise by the Architect.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life.
   1. Collect, recycle, reuse, and dispose of demolished materials as specified in Section 01150 – Environmental Procedures.

B. Remove existing paving, curbs, and other structures as may be indicated on Drawings.

3.6 PROTECTION

A. Protect existing streets, structures, and utilities as specified in Section 02200.

END OF SECTION 02230

SECTION 02480 - LANDSCAPING AND IRRIGATION SYSTEM

PART 1 - GENERAL

1..1 RELATED DOCUMENTS:

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

B. Concrete mow strips, see Section 02753.

1..2 SUMMARY:

A. Furnish and install sprinkler system as described in Contract Documents complete with accessories necessary for proper function.

B. Provide maintenance for landscaping as described in Contract Documents.

C. Furnish and install sodded lawn where shown on the drawings and as described in Contract Documents.

D. General Contractor shall rough grade topsoil over landscaping areas. Landscape Contractor shall fine grade topsoil and prepare it for accepting planting materials.

E. Warranties.
1. Drip-type irrigation system, one year.
2. Sodded lawn, 90 days, with 30-day maintenance period.
3. Shrubs and trees, one year.

F. If noted on plans, Landscape Allowance shall be used for purpose of bidding landscape work. See plans for allowance amount. Landscape contractor and Architect shall formulate landscape plans after the bid. The Landscape Contractor shall prepare landscape plans for approval by Architect, prior to commencement of landscaping work.

G. Related Sections:

1. Section 02230 – Site Clearing: Mulch from recycled site debris.
2. Section 09250 – Gypsum Drywall: Soil amendment from recycled scrap gypsum construction materials.

1..3 SUBMITTALS:

A. Product Data: Submit sprinkler system manufacturer's data for each type of materials, fittings, valves, pipes, etc.

1. Provide professionally drafted irrigation system plan.
   a. Specify number of valves located in each control box.
   b. Indicate location and number of sleeves under pavement.

2. List plant materials to be used.
   a. Denote any substitutions to plant materials or plant sizes.

B. Irrigation System 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. At job site, maintain one copy of Contract Documents, and relevant shop drawings. Clearly mark each document "PROJECT RECORD COPY" and maintain in good condition for use of Architect and Owner.

3. Reduce copy of as-built drawing to half-size, color key circuits, and laminate both sides with 5 mil thick or heavier plastic. Mount on 1/4 inch plywood board. Drill two 1/2 inch holes at top of board and hang hooks in Custodial Room or as directed by Architect.

4. Final payment for system will not be authorized until accurate and complete submittals are delivered to Architect.

C. Irrigation System Operations And Maintenance Manual Data Shall Include:

1. Product data.
2. Instruction manual, which lists complete instructions for system operation and maintenance, including winterizing.

D. Lawn Sodding Operations And Maintenance Manual Data Shall Include:

1. Supplier's literature on seed mixture use for sod.
2. Written instructions on maintenance requirements for final 60 days of 90-day guarantee period specified in Section Landscape Maintenance.

1..4 QUALITY ASSURANCE:

A. Irrigation System

1. Regulatory Requirements:

   a 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.

2. Pre-Installation Conference:

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

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

B. Certified Sod, where shown on drawings:

1. Superior sod grown from certified, high-quality seed of known origin or from plantings of certified grass seedlings or stolons.

2. Inspect sod to:

a. Assure satisfactory genetic identity and purity.
b. Assure over-all high quality and freedom from noxious weeds or an excessive amount of other crop and weedy plants at time of harvest.

3. Sod shall be composed of two varieties minimum of Kentucky Bluegrass.

C. Plant Materials

1. All plants, shrubs, trees shall be best quality nursery stock. All items shall be healthy, disease free specimens.

1..5 DELIVERY, STORAGE AND HANDLING:

A. Deliver all materials to project in undamaged healthy condition.

B. Store and handle plant and irrigation materials to prevent damage or deterioration.

C. Protect plants from drying; water as necessary to insure vitality.

D. Lawn Sodding, where shown on drawings:

1. Cut and lift sod by approved methods. Cut sod in pieces approximately: to one inch thick. Roll or fold sod so it may be lifted and handled without breaking or tearing and without loss of soil.

2. Schedule deliveries to coincide with topsoil operations and laying. Keep storage at job site to minimum without causing delays.

a. Deliver, unload and store sod on pallets within 24 hours of being lifted.
b. Do not deliver small, irregular or broken pieces of sod.

3. Storage:

a. During Wet Weather:

1) Allow sod to dry sufficiently to prevent tearing during lifting and handling.

b. During Dry Weather:

1) Protect sod from drying; water as necessary to insure its vitality and prevent excess loss of soil in handling. Sod that dries out will be rejected.

1..6 WARRANTY:

A. Irrigation System.

1. Standard one-year guarantee stipulated in General Conditions shall include
   a. Filling and repairing depressions and replacing plantings due to settlement of irrigation trenches for one year following acceptance of Project.
   b. System can be adequately drained to protect from freeze damage in areas where freezing occurs.
   c. System has been adjusted to supply proper coverage of areas to receive water.

B. Sodded Lawn, where shown on drawings.

1. Sodded lawn shall be warranted for 90 days after A Final Acceptance @ (See 3..2.C).
2. Lawn, which does not live and has to be replaced, shall be guaranteed and maintained an additional 30 days from date of replacement.

C. Plant Materials.

1. All shrubs, trees, and ground cover shall be warranted for a period of one year from installation.
2. Any plants that die within this period shall be replaced at no cost to the owner.

1..7 ENVIRONMENTAL REQUIREMENTS:

A. Resource Management:

1. Renewable Resources: Plants specified are indigenous, low maintenance varieties, tolerant of site's existing soils and climate without supplemental irrigation or fertilization once established.

   a. Soil amendments: No chemical fertilizers; use organic/natural matter to support establishment of indigenous plants; use inorganic materials such as sand or gypsum to improve workability and drainage of soil as appropriate to indigenous plants.
   b. Mulch: Provide organic mulch products.

2. Recycled Content:

   a. Wood fiber mulch: Provide products manufactured from 100% post-consumer paper content and yard trimming composts.
   b. Mulch from recycled site debris: Coordinate with Section 02230 – Site Clearing to identify and prepare suitable organic debris for use as mulch on site.
   c. Soil amendment from recycled scrap gypsum: Coordinate with Section 09250 – Gypsum Board to prepare scrap gypsum board for use as soil amendment.

PART 2 - PRODUCTS

2..1 IRRIGATION SYSTEM PIPE, PIPE FITTINGS, AND CONNECTIONS:

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

B. Pipe sizes shall be determined by installer in order to provide proper system design.

C. Pipe:
   1. Pressure Lines and Lateral Lines - Schedule 40 PVC.

D. Fittings:
   1. Schedule 40

E. Sleeves:

   1. Under Parking Area and Driveway Paving - Schedule 40 PVC Pipe.
   2. All Other - Class 200 PVC Pipe.
   3. Sleeve diameter shall be as determined by landscape contractor.
   4. Extend sleeves 6 inches minimum beyond walk or pavement edge.

2..2 IRRIGATION SYSTEM SPRINKLER HEADS:

A. Provide drip irrigation system where called for on plans.

2..3 IRRIGATION SYSTEM SPRINKLER RISERS:

A. Provide drip irrigation system where called for on plans.

2..4 IRRIGATION SYSTEM AUTOMATIC SPRINKLER SYSTEMS:

A. Provide control valves as required providing proper system design.

B. Control wire shall be UF-UL listed, color-coded copper conductor direct burial size 14. Tape control wire to side 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 all others.

2..5 IRRIGATION SYSTEM VALVES:

A. Manual Drain Valves:

   1. Brass ball valve with "T" handle on main lines and in valve boxes on lateral lines.
   2. Quality Standard - NIBCO Brass Ball Gas Cock with Teflon seat.

B. Automatic Drain Valves:
   1. Plastic "King Drain". Use only on lateral lines.

C. Electric Valves:

1. Make and model as required to provide proper system design.

D. Gate Valves:

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

E. Automatic Controller:

1. Make and Model as required to provide proper system design.

F. Quick Coupling Valve:
1. Brass one-piece valve with locking top.
2. Provide one key with hose swivel.

2..6 IRRIGATION SYSTEM VALVE ACCESSORIES

A. Valve Boxes:

1. Rectangular heavy-duty valve box.
2. Valve boxes shall have lock top or snap top lids.
3. Valve boxes shall be large enough for easy removal or maintenance of valves.
4. Use valve box extensions as required.
5. Approved Manufacturers:

a. Ametek
b. Brooks

2..7 IRRIGATION SYSTEM BACKFILL MATERIALS:

A. Rock-Free Soil - (backfill soil around PVC pipe).

1. Soil having rocks no longer than 1/4 inch in any dimension.

B. Pea Gravel - (for use around drains).

1. 1/2 inch maximum round, water worn, washed rock.

C. Sand.

1. Fine granular material naturally produced by rock disintegration and free from organic material, mica, loam, clay, and other deleterious substances.

D. Native Material.

1. Soil native to project site free of wood and other deleterious materials and rocks over 1 1/2 inches.

E. Topsoil.

1. Existing in-place topsoil material. Remove rocks, roots sticks, clods, debris, and other foreign matter over 1 1/2 inches longest dimension encountered during trenching.

2..8 LAWN SODDING FERTILIZER:

A. Commercial 16-16-8.

2..9 PLANT MATERIALS

A. Provide plants, shrubs, trees as per plant list shown on plans, and quantities shown on drawings.

2.10 pH ADJUSTERS

A. Lime:

1. Material: ASTM C 602, Class T, agricultural commercial grade ground limestone containing not less than 50 percent of total oxides.
2. Gradation: Minimum 75 percent passing 100 mesh sieve and 100 percent passing 20 mesh sieve.

B. Ferrous Sulfate: Commercial Grade.

2.11 FERTILIZER

A. Bone meal: Commercial, raw, finely ground; minimum 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial-Grade complete fertilizer of neutral character consisting of fast-and-slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium.

C. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorous, and potassium.

2..12 OTHER MATERIALS:

A. Recommended by Manufacturer and subject to Architect's review and acceptance.

B. Provide materials necessary to complete and make system operational.

PART 3 - EXECUTION

3..1 IRRIGATION SYSTEM:

A. Irrigation System Preparation.

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

a. 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.
b. Do not cut existing tree roots measuring over 2 inches in diameter in order to install sprinkler lines.

B. Irrigation System Installation.

1. Trenching and Backfilling.

a. Pulling of pipe is not permitted.
b. Over-excavate trenches 2 inches and bring back to indicated depth by filling with fine, rock-free soil or sand.
c. Cover pipe both top and sides with 2 inches of material specified in Paragraph 2..7 above. In no case shall there be less than 2 inches of rock-free soil or sand surrounding pipe.
d. Do not cover pressure main, sprinkler pipe, or fittings until Architect has inspected and approved system.

2. Sleeving.

a. Sleeve water lines and control wires under walks and paving.
b. Use one water pipe maximum per sleeve. Sleeve control wiring in separate sleeve.
c. Position sleeves with respect to buildings or other obstructions so pipe can be easily removed.

3. Grades and Draining.

a. In areas where freezing may occur, grade piping so system can be completely drained.

1) Slope pipe to drain to control valve box where possible.
2) Where this is not possible, slope pipe to a minimum number of low points. At these low points, install:

a) 3/4 inch brass ball valve for a manual drain or, if low point is in middle of lawn area or other area where a manual drain would be hard to find, then install an automatic King drain.
b) Install 2 inch Class 200 PVC pipe over top of manual drain and cut at finish grade.
c) Provide rubber valve cap marker.
d) Provide one cu ft gravel sump at outlet of each manual or automatic drain.

e) Do not use automatic drain valves on pressure mains or in valve boxes.

b. Slope pipes under parking areas or driveways to drain outside these areas.
c. Provide and install quick-coupling valve or valves in location for easy blowout of entire system.

4. Installation of Irrigation System Plastic Pipe.

a. Install plastic pipe in manner to provide for expansion and contraction as recommended by Manufacturer.
b. Unless otherwise indicated on Drawings, install main lines and lateral lines with minimum cover of 18 inches based on finished grade. Install remaining lateral lines with minimum of 12 inches of cover based on finish grade.
c. Install pipe and wires under driveways or parking areas in specified sleeves 18 inches minimum below finish grade or as shown on Drawings.
e. Drawings show arrangement of piping. Should local conditions necessitate rearrangement, obtain approval of Architect before proceeding with work.
f. Cut plastic pipe square. Remove burrs at cut ends prior to installation so unobstructed flow will result.
g. Make solvent weld joints in the following manner:

1) Do not make solvent weld joints if ambient temperature is below 40 deg F.
2) Clean mating pipe and fitting with clean, dry cloth and apply one coat of P-70 primer to each.
3) Apply uniform coat of 711 solvent to outside of pipe.
4) Apply solvent to fitting in a similar manner.
5) Re-apply light coat of solvent to pipe and quickly insert into fitting.
6) 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.
7) Hold in position for 15 seconds minimum or long enough to secure joint.
8) Wipe off solvent appearing at outer shoulder of fitting.
9) Do not use excessive amount of solvent thereby causing obstruction to form on inside of pipe.
10) Allow joints to set at least 24 hours before applying pressure to PVC pipe.

h. Tape threaded connections with Teflon tape.

i. If pipe is larger than 2 inches, install concrete thrust blocks wherever change of direction occurs on PVC main pressure lines, unless otherwise detailed on Drawings.

5. Irrigation System Control Valves and Controller.

a. Install controller, control wires, and valves in accordance with Manufacturer's recommendations and according to electrical code.
b. Install valves, except King Automatic Drains, in plastic boxes with reinforced heavy-duty plastic covers. Locate valve box tops at finish grade. Do not install more than two valves in a single box.
c. Set valve boxes over valve so all parts of valve can be reached for service. Set cover of valve box even with finish grade. Place 6 inches minimum of gravel below valve for drainage. Maintain 4 inches minimum between bottom of valve and top of gravel. Valve box shall be reasonably free from dirt and debris.

d. Install 3/4" inch brass ball drain valve in valve box on downstream side of automatic valves if lateral line slopes toward valve box.

6. Sprinkler Heads.

a. Prior to installation of sprinkler heads, open control valves and use full head of water to flush out system.
b. Set sprinkler heads and quick-coupling valves perpendicular to finish grade.
c. Set lawn sprinkler heads adjacent to existing walks, curbs, and other paved areas to grade.

7. Valve Stations.

a. Arrange valve stations to operate in an easy-to-view progressive sequence around building. Record sequence on controller lid.

C. Irrigation System Field Quality Control.

1. Flushing and Testing.

a. Test pressure lines at line pressure and make certain there are no leaks before back-filling.
b. Notify Architect prior to testing.

3..2 LAWN SODDING, where shown on drawings:

A. Lawn Sodding Preparation.

1. Do not commence work of this Section until grading tolerances specified are met.
2. Protection.

a. Take care and preparation in work to avoid conditions which will create hazards. Post signs or barriers as required.
b. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.
c. Keep site well drained and landscape excavations dry.

3. Site Preparation.

a. Do not commence work of this section until work of landscape related Sections have been completed and approved.
b. Loosen area 4 inches deep, dampen thoroughly, and cultivate to properly break up clods and lumps.
c. After cultivation, rake area to remove clods, rocks, weeds, roots, and debris. Perform grading and shaping refinements to bring surface to true uniform planes free from irregularities and to provide drainage and proper slope to catch basins.
d. Just prior to sodding, fertilize lawn areas with specified material at 15 lbs per 1000 sq. ft.
e. After lawn areas have been fertilized, take no heavy objects over them except lawn rollers.
f. After preparation of lawn areas and with topsoil in semi-dry condition, roll lawn planting areas in two directions at approximately right angles with water ballast

roller weighing 100 to 300 lbs according to soil type.

g. Rake or scarify and cut or fill irregularities that develop as required and again roll until area is true and uniform, free from lumps, depressions, and irregularities.

B. Lawn Sodding Installation.

1. Lay sod during growing season. Sodding during dry summer periods, at freezing temperatures, or over frozen soil is not acceptable.
2. Lay sod within 36 hours of being lifted.
3. Lay sod in rows with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with a sharp knife.
4. Lay sod flush with adjoining existing native grass and wildflower surfaces. Top of sod dirt shall be 1 inch below top of concrete walks or curbs.
5. After sodding has been completed, roll horizontal surface areas in two directions perpendicular to each other.
6. Repair and re-roll areas with depressions, lumps, or other irregularities.
7. Heavy rolling to correct irregularities in grade will not be permitted.
8. Water sodded areas immediately after sod laying to obtain moisture penetration through sod into top 4 inches of topsoil.
9. Replace damaged areas at no additional cost to Owner.
10. Do not sod slopes steeper than 3:1. Consult with Architect for alternate treatment.
11. Allowable Tolerances:

    a. Final grade of soil after sodding of lawn areas is complete shall be one inch below top of adjacent pavement.

C. Lawn Sodding Field Quality Control.

1. Final Acceptance.

    a. Sodded areas will be accepted at final inspection if:

        1) Sodded areas are properly established.
        2) Sod is free of bare and dead spots and without weeds.
        3) No surface soil is visible when grass has been cut to height of 2 inches.
        4) Sodded areas have been mowed a minimum of two times.

    b. Areas sodded after November 1st will be accepted the following spring (May 1st) approximately one month after start of growing season if specified conditions have been met.

3..3 FINAL ADJUSTMENT AND CLEANING:

A. Irrigation System.

1. Irrigation system 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 so spray does not fall on building. Adjust watering time of valves to provide proper amounts of water to all

plants.

2. Irrigation system demonstration.

   a. After system is installed and approved, instruct maintenance personnel in complete operation and maintenance.

3. Extra materials.

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

      1) One heavy-duty key for stop and waste or main shut-off valve.
      2) Two valve box cover keys.

4. Maintenance Service, Winterizing.

   a. Drain entire system at end of first watering season following installation.
   b. Have maintenance personnel assist and be trained in winterizing procedure.

B. Lawn Sod, where shown on drawings.

1. Lawn sodding cleaning.

   a. Immediately clean up any soil or debris spilled onto pavement and dispose of all deleterious materials.

2. Lawn sodding protection.

   a. Protect sodded areas against traffic or other use immediately after sodding is completed by placing adequate warning signs and barricades.
   b. Provide adequate protection of sodded areas against trespassing, erosion, and damage of any kind. Remove this protection after Architect has accepted sodded areas.

3..4 LANDSCAPE MATERIALS MAINTENANCE:

A. General.

1. Maintain landscaping for 30 days after completion of landscape installation and acceptance of landscape work by Architect.
2. If landscape work is not completed and accepted by Architect prior to November 1st of year work is performed, then maintenance period and plant guarantee period shall extend to May 1st of following year. Landscape work, which does not live and has to be replaced, shall be maintained an additional 30 days from date of replacement.
3. Replace landscaping that is dead or appears dead as directed by Architect at end of maintenance period. Make replacements within 10 days of notification.

B. Sodded Lawn, where shown on drawings.

1. Maintain sodded lawn areas until lawn complies with specified requirements and through maintenance period.
2. Water sodded areas in sufficient quantities and at required frequency to maintain sub-soil immediately under sod continuously moist 3 to 4 inches deep.

3. Cut grass first time when it reaches 3 inches high. Continue to mow at least once a week throughout the maintenance period. Remove clippings.
4. Apply weed killer when broadleaf weeds start developing in competition with grass. Apply weed 4.killer in accordance with manufacturer′s instructions during calm weather when air temperature is above 50 deg F.
5. At end of 30 days maintenance period, fertilize lawns with 16-16-8 at rate recommended by Fertilizer Manufacturer.

C. Trees, Shrubs, and Plants.

1. Maintain by pruning, cultivating, and weeding as required for healthy growth.
2. Restore planting basins.
3. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical positions as required.
4. Spray as required keeping trees and shrubs free of insects and disease.
5. Provide supplemental water by hand as needed in addition to water from sprinkling system.

D. Contractor is to maintain all plant materials and planting beds for one year from completion.

END OF SECTION

SECTION 02510 - WATER DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Domestic water system pipe and fittings.
2. Connection of domestic water system to municipal water system.
3. Fire protection water system pipe, fittings, valves, and hydrants.
4. Connection of fire protection water system to municipal water system.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:
1. Section 02200 - Excavation and Fill: Earthwork for utilities.
2. Section 03310 - Cast-In-Place Concrete: Concrete for thrust blocks.

1.2 REFERENCES

A. American Society of Mechanical Engineers (ASME):
1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

B. American Society for Testing and Materials (ASTM):
1. ASTM B 88 - Specification for Seamless Copper water Tube.
2. ASTM D 1785 - Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
3. ASTM D 2241 - Specification for Polyvinyl Chloride (PVC) Pressure Rated Pipe (SDR Series).
4. ASTM D 3034 - Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
5. ASTM D 3139 - Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.

C. American Water Works Association (AWWA):
1. AWWA C 110 - Gray-Iron Fittings, 3 inches Through 48 Inches, for Water and Other Liquids.
2. AWWA C 111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
3. AWWA C 151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
4. AWWA C 504 - Rubber Seated Butterfly Valves.
5. AWWA C 509 - Resilient Seated Gate Valves 3 inch through 12 inch NPS, for Water and Sewage Systems.
6. AWWA C 600 - Installation of Ductile-Iron Water Mains and Appurtenances.
7. AWWA C 900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch, for Water.

1.3 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
   1. Product Data: Data for each type of pipe, pipe fitting, valve and accessory specified.
   2. Assurance/Control Submittals:
      a. Certificates: Manufacturer’s certificate certifying that Products meet or exceed specified requirements and standards.

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
   1. Project Record Documents: Accurately record the following:
      a. Locations of piping mains, valves, connections, and top of pipe elevations.
      b. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Perform work in accordance with utility company requirements and local authority having jurisdiction requirements.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect Products.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.1 PIPE

A. Pipe sizes less than 3 inch that are installed below grade and outside building shall comply with one or combination of following:
   1. Seamless Copper Tubing: Type "K" soft copper to comply with ASTM B 88 latest edition and installed with wrought copper (95-5 Tin Antimony solder joint) fittings in accordance with ASME B16.22.
   2. Polyvinyl Chloride (PVC) Water Pipe: Pipe shall conform to ASTM D 2241 with an SDR 21 rating and shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 1785 classification. Pipe joints shall be integrally molded bell ends in accordance with ASTM D 3139 with factory supplied elastomeric gaskets and lubricant.

B. Pipe sizes 3 inch and larger that are installed below grade and outside building shall comply with one of the following:
   1. Ductile Iron Water Pipe: In accordance with AWWA C 151, Fittings shall be either mechanical joint or push-on joint complying with AWWA C 110 or AWWA C-111 (CLASS 50).
   2. Polyvinyl Chloride (PVC) Water Pipe: Pipe shall meet the requirements of AWWA C-900 and comply with ASTM D 2241, rated SDR 21 (Class 150). Pipe shall be continually marked as for smaller pipes. Pipe joints shall be integrally molded bell ends in accordance with ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.

2.2 GATE VALVES - 2 Inches and Larger

A. Manufacturers: Mueller Resilient Seat Gate Valves.

B. AWWA C509, Iron body, bronze mounted double disc, parallel seat type, non-rising stem with square nut, single wedge, resilient seat, flanged or mechanical joint ends, control rod, post indicator where indicated on Drawings, extension box and valve key.

C. Section 01600 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.3 BALL VALVES - 2 Inches and Smaller

A. Manufacturers: Mueller Oriseal.

B. Brass body, Teflon-coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA compression inlet end, compression outlet with electrical ground connector, with control rod, extension box and valve key.

C. Section 01600 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.4 BUTTERFLY VALVES - 2 inches to 24 inches

A. AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, infinite position lever handle.

2.5 HYDRANTS

A. Hydrant: Type as required by utility company, local authority having jurisdiction, and as indicated on Drawings.

B. Hydrant Extensions: Provide in multiples of 6 inches with rod and coupling to increase barrel length.

C. Hose and Stream Connection: Match sizes with utility company, two hose nozzles, one pumper nozzle.

D. Finish: Primer and two coats of enamel or special coating to color as required by utility company.

2.6 ACCESSORIES

A. Concrete for Thrust Blocks: Section 03310. Place thrust blocking consisting of 2,500 psi concrete to provide sufficient bearing area to transmit unbalanced thrust from bends, tees, caps, or plugs to undisturbed soil without loading undisturbed soil in excess of 2,500 pounds per square foot when water main pressure is 100 psi.

MINIMUM THRUST BLOCKING BEARING AREAS

Pipe Diameter	Tees Sq. Ft.	90˚ Bend Sq. Ft.	45˚ Bend Sq. Ft.	22˚ Bend Sq. Ft.	11˚ Bend Sq. Ft.
3"	1.0	1.0	1.0	1.0	1.0
4"	1.0	1.0	1.0	1.0	1.0

6"	1.5	2.0	1.0	1.0	1.0
8"	2.5	3.5	1.8	1.0	1.0
10"	4.0	5.5	2.8	1.5	1.0
12"	6.0	8.0	4.0	2.0	1.5
14"	8.0	11.0	5.5	3.0	2.0
16"	10.0	14.2	7.0	4.0	3.0
18"	21.0	21.0	12.0	6.0	4.0

B. Locked Mechanical Joint fittings shall be installed where vertical changes in direction are required and, if approved by Owner's representative, can be installed in lieu of the above thrust blocking requirements.

C. Trace Wire: Magnetic detectable conductor, clear brightly colored plastic covered, imprinted in large letters.
   1. Domestic Water Lines: "DOMESTIC WATER SERVICE"
   2. Fire Protection Water Lines: "FIRE PROTECTION WATER SERVICE"

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify trench cut, excavations, dimensions, and elevations are as indicated on Drawings.

C. Report in writing to Owner's representative prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter, which could damage pipe or impede consistent backfilling or compaction.

C. Cut pipe ends square, ream pipe and tube ends and remove burrs.

D. Remove scale and dirt, on inside and outside, before assembly.

E. Prepare pipe for connections to equipment with flanges or unions.

3.3 BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 02200 for work of this Section. Provide trench wall shoring as required.

B. Form and place concrete for pipe thrust restraints at any change of pipe direction and at fittings as indicated on Drawings. Place concrete to permit full access to pipe and pipe accessories. Provide thrust restraint bearing on subsoil per schedule on Drawings.

C. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth, each layer. Place compacted bedding material to elevation of paving subgrade as indicated on Drawings.

D. Maintain optimum moisture content of bedding material to attain required compaction density.

E. Remove excess backfill and excavated material from site.

3.4 INSTALLATION - PIPE AND FITTINGS

A. Maintain separation of water main from sanitary and storm sewer piping in accordance with state or local code.

B. Install pipe and fittings in accordance with AWWA C600.

C. Install pipe to allow for expansion and contraction without stressing pipe or joints or as specified by pipe manufacturer.

D. Install access fittings in accordance with local codes to permit disinfection of water system performed under this Section.

E. Connections with Existing Pipelines: Where connections are made between new work and existing piping, make connection using suitable fittings for conditions encountered. Make each connection with existing pipe at time and under conditions which least interfere with operation of existing pipeline and in compliance with the local utility company.

F. Form and place concrete for thrust blocks or other specified methods of retainage at each change of direction or end of pipe main.

G. Establish elevations of buried piping in accordance with Section 02200 for work in this Section.

H. Backfill trench in accordance with Section 02200.

I. Install trace wire continuous buried 10 inches below finish grade, above pipeline. Trace wire shall be in accordance with local utilities standards.

3.5 INSTALLATION - VALVES AND HYDRANTS **(NOT APPLICABLE)**

A. Install gate valves as indicated on Drawings and supported on concrete pads with valve stem vertical and plumb. Install valve boxes in a manner that will not transmit loads, stress, or shock to valve body. Center valve box over operating nut of valve vertical and plumb. Securely fit valve box together leaving cover flush with finished surface.

B. Install fire hydrant assemblies as indicated on Drawings in vertical and plum position with stream/pumper nozzle pointed perpendicular to traffic where hydrant is adjacent to a street, roadway or parking lot drive or toward the protected building unless otherwise directed by local authorities. Support hydrant assembly on concrete pad and firmly braced on side opposite inlet pipe against undisturbed soil and concrete blocking. Place minimum of 6 cu. ft. of crushed stone or gravel around hydrant base and barrel after thrust blocking has cured at least 24 hours. Exercise care when backfilling and compacting so proper vertical position will not be altered.

C. Provide a drainage pit 36 inches square by 24 inches deep filled with 2 inch washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to sewer.

D. Paint hydrants in accordance with local utility company requirements.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect distribution system with chlorine before acceptance for domestic operation. Amount of chlorine shall be such as to provide dosage of not less than 50 parts/million. Thoroughly flush lines before introduction of chlorinating materials and after contact period of not less than 24 hours, system shall be flushed with clean water until residual chlorine content is not greater than 1.0 part/million. Open and close valves in lines being disinfected several times during contact period. After disinfection, take water sample and bacteriological test in accordance with AWWA specifications. Do not place distribution system in service until approval is obtained from applicable governing authorities.

3.7 SERVICE CONNECTIONS

A. Provide water service connection in compliance with utility company requirements including reduced pressure backflow preventer if required and water meter with by-pass valves and sand strainer.

3.8 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field-testing and inspection.

B. Site Tests:
   1. Compaction:
      a. Perform inspections prior to and immediately after placing bedding.
      b. Perform tests as specified in Section 02200.
   2. Piping: Water distribution system pipe installed below grade and outside building shall be tested in accordance with following procedures:
      a. Perform the testing of pipe materials, joints, and/or other materials incorporated into the construction of water mains and force mains to determine leakage and watertightness. All pressure pipelines shall be tested in accordance with Section 4 of AWWA C600 latest edition. In the event any state or local code requires a more stringent test, the more stringent shall apply.
      b. Pressure Test: After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing and not less than 1.25 times the working pressure at the highest point along the test section.
      c. Leakage Test: The leakage test shall be conducted concurrently with the pressure test. Leakage is defined as the quantity of water that must be supplied into the newly laid pipeline, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipeline has been filled with water. Leakage shall not be measured by a drop in pressure in a test section

over a period of time. No pipeline installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD\,P}{133200}$$

L = allowable leakage, (gallons per hour)

S = length of pipe tested, (feet)

D = nominal diameter of pipe, (inches)

P = average test pressure during test, (psig)

d. Visible Leakage: All visible leaks shall be repaired regardless of the amount of leakage.
e. Acceptance of Installation: If any test of pipe laid in place discloses leakage greater than that specified, the Contractor shall, at his own expense, locate the leak and make repairs as necessary until the leakage is within the specified allowance. Contractor shall supply all water for testing at no additional cost to Owner.
f. Provide one copy of results of meter test and hydrostatic pressure test to Owner's representative and utility company upon completion of water distribution backfilling operations.

END OF SECTION 02510

SECTION 02513 - ASPHALT CONCRETE PAVING

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 DESCRIPTION OF WORK:

A. After determination and review of site soils conditions, Develop Specifications acceptable to Owner for methods and materials to be used for cutting subgrade, constructing appropriate base and subbase, and placing of asphalt pavement.

1..3 SUBMITTALS:

A. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

1..4 QUALITY ASSURANCE:

A. Codes and Standards: Comply with State highway or transportation department standard specifications, latest edition, and with local governing regulations if more stringent than herein specified.

1..5 SITE CONDITIONS:

A. Weather Limitations: Apply prime and tack coats when ambient temperature is above 50 deg. F (10 deg. C), and when temperature has not been below 35 deg. F (1 deg. C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct asphalt concrete surface course when atmospheric temperature is above 40 deg. F (4 deg. C), and when base is dry. Base course may be placed when air temperature is above 30 deg. F (-1 deg. C) and rising.

C. Grade Control: Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

1..1 MATERIALS:

A. General: Use locally available materials and gradations which exhibit a satisfactory record of previous installations.

B. Base Course Aggregate: Sound, angular crushed stone, crushed gravel, or crushed slag, sand, stone or slag screenings.

C. Surface Course Aggregate: Crushed stone, crushed gravel, crushed slag, and sharp-edged natural sand.

D. Asphalt Cement: AASHTO M 226 (ASTM D 3381) for viscosity-graded material and AASHTO M 20 (ASTM D 946) for penetration-graded material.

E. Prime Coat: Cut-back asphalt type; AASHTO M 82 (ASTM D 2027) MC- 30, MC-70 or MC-250.

F. Tack Coat: Emulsified asphalt; AASHTO M 140 (ASTM D 977) or M 208 (D 2397); SS-1, SS-1h, CSS-1 or CSS-1h, diluted with one part water to one part emulsified asphalt.

G. Herbicide Treatment: Commercial chemical for weed control, registered by Environmental Protection Agency. Provide granular, liquid, or wet-able powder form.

H. Lane Marking Paint: Chlorinated rubber-alkyd type, AASHTO M 248 (FS TT-P-115), Type III.

1..2 ASPHALT-AGGREGATE MIXTURE:

A. Provide plant-mixed, hot-laid asphalt-aggregate mixture complying with ASTM D 3515 and as recommended by local paving authorities to suit project conditions.

PART 3 - EXECUTION

1..1 SURFACE PREPARATION:

A. Remove loose material from compacted subbase surface immediately before applying herbicide treatment or prime coat.

B. Proof roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.

C. Notify Contractor of unsatisfactory conditions. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

D. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subbase prior to application of prime coat.

E. Prime Coat: Apply at rate of 0.20 to 0.50 gal. per sq. yd., over compacted subgrade. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile.

F. Tack Coat: Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.05 to 0.15 gal. per sq. yd. of surface.

G. Allow to dry until at proper condition to receive paving.

H. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces.

Replace or clean damaged surfaces.

1..2 PLACING MIX:

A. General: Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225 deg. F (107 deg. C). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.

B. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

1..3 ROLLING:

A. General: Begin rolling when mixture will bear roller weight without excessive displacement.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

D. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and 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.

1..4 TRAFFIC AND LANE MARKINGS:

A. Cleaning: Sweep and clean surface to eliminate loose material and dust.

B. Striping: Use chlorinated-rubber base traffic lane marking paint, factory-mixed, quick-drying, and non-bleeding.

1. Color: White.
2. Color: Yellow.

C. Do not apply traffic and lane marking paint until layout and placement has been verified with Architect.

D. Apply paint with mechanical equipment to produce uniform straight edges. Apply in **2 coats** at manufacturer's recommended rates.

1..5 FIELD QUALITY CONTROL:

A. General: Test in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Architect.

B. Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

C. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness, using 10' straightedge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness.

D. Check surface areas at intervals as directed by Architect.

END OF SECTION 02513

SECTION 02520 - PORTLAND CEMENT CONCRETE PAVING

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: After determination and review of site soils conditions, Develop Drawings and Specifications acceptable to Owner for methods and materials to be used for cutting subgrade, constructing appropriate base and subbase, and placing of Concrete pavement.

1..3 SUBMITTALS

A. Provide samples, manufacturer's product data, test reports, and materials' certifications as required in referenced sections for concrete and joint fillers and sealers.

1..4 QUALITY ASSURANCE

A. Codes and Standards: Comply with local governing regulations.

1..5 JOB CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

1..1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

1. Use flexible spring steel forms or laminated boards to form radius bends as required.

B. Coat forms with a nonstaining form release agent that will not discolor or deface surface of concrete.

C. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185.

1. Furnish in flat sheets, not rolls, unless otherwise acceptable to Architect.

D. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 60.

E. Fabricated Bar Mats: Welded or clip-assembled steel bar or rod mats, ASTM A 184. Use ASTM A

615, Grade 60 steel bars, unless otherwise indicated.

F. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

G. Hook Bolts: ASTM A 307, Grade A bolts, 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.

H. Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

I. Expansion Joint Materials: Fiberboard for preformed expansion joint fillers and sealers.

J. Anti-spalling Compound: Combination of boiled linseed oil and mineral spirits, complying with AASHTO M-233.

K. Liquid-Membrane Forming and Sealing Curing Compound: Comply with ASTM C 309, Type I, Class A unless other type acceptable to Architect. Moisture loss no more than 0.055 gr./sq. cm. when applied at 200 sq. ft. / gal.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. "Masterseal"; Master Builders.
   b. "A-H 3 Way Sealer"; Anti-Hydro Waterproofing Co.
   c. "Ecocure"; Euclid Chemical Co.
   d. "Clear Seal"; A. C. Horn.
   e. "J-20 Acrylic Cure"; Dayton Superior.
   f. "Sure Cure"; Kaufman Products Inc.
   g. "AR -30" W.R. Meadows. "Spartan-Cote"; The Burke Co.
   h. "Sealkure"; Toch Div. - Carboline.
   i. "Kure-N-Seal"; Sonneborn-Contech.
   j. "Polyclear"; Upco Chemical/USM Corp.
   k. "L&M Cure"; L & M Construction Chemicals.
   l. "Klearseal"; Setcon Industries.
   m. "LR-152"; Protex Industries.
   n. "Hardtop"; Gifford - Hill.

1..2 CONCRETE MIX, DESIGN, AND TESTING

A. Comply with requirements of applicable Division 3 sections for concrete mix design, sampling and testing, and quality control and as herein specified.

B. Design mix to produce normal-weight concrete consisting of Portland cement, aggregate, water-reducing or high-range water-reducing admixture (superplasticizer), air-entraining admixture, and water to produce the following properties:
   1. Compressive Strength: Use 6½ bags W/C = 0.45, minimum at 28 days, unless otherwise indicated.
   2. Slump Limits: 6 inches minimum for concrete containing high- range water-reducing admixture (superplasticizer); 3 inches for other concrete.
   3. Air Content: 6½ % 1½%.
   4. USE WATER-CEMENT RATIO OF 0.53 FOR CONCRETE SUBJECT TO FREEZING AND THAWING; USE WATER-CEMENT RATIO OF 0.45 FOR CONCRETE SUBJECT TO DEICERS.

PART 3 - EXECUTION

1..1 SURFACE PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

B. Proof-roll prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

1..2 FORM CONSTRUCTION

A. Set forms to required grades and lines, braced and secured. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork for grade and alignment to following tolerances:

1. Top of forms not more than 1/8 inch in 10 feet.
2. Vertical face on longitudinal axis, not more than 1/4 inch in 10 feet.

C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

D. Slope step treads at 1/4 inch per foot to drain.

1..3 REINFORCEMENT

A. Locate, place and support reinforcement as specified in Division 3 sections, unless otherwise indicated.

1..4 CONCRETE PLACEMENT

A. General: Comply with requirements of Division 3 sections for mixing and placing concrete, and as herein specified.

B. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

C. Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with 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 dislocation of reinforcing, dowels, and joint devices.

D. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

E. Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than 1/2 hour, place a construction joint.

F. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results that meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

1..5 JOINTS

A. General: Construct expansion, weakened-plane (contraction), and construction joints true to line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

B. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

C. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
2. Sawed Joints: Form weakened-plane joints with powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.

D. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for more than 1/2 hour, except where such placements terminate at expansion joints.

1. Construct joints as shown or, if not shown, use standard metal keyway-section forms.

E. Expansion Joints: Provide pre-molded joint filler for expansion joints abutting concrete curbs, foundation walls, structures, walks, and other fixed objects, unless otherwise indicated.

1. Locate expansion joints as indicated on drawings

F. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.

G. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.

H. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

I. Fillers and Sealants: Comply with requirements of applicable Division 7 sections for preparation of joints, materials, installation, and performance.

1..6 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and

produce uniform texture.

B. After floating, test surface for trueness with a 10-ft. straightedge. Distribute concrete as required to remove surface irregularities, and re-float repaired areas to provide a continuous smooth finish.

C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2-inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and when excess moisture or surface sheen has disappeared, complete troweling and finish surface as follows:

1. Broom finish by drawing a fine-hair broom across concrete surface perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Architect.

a. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.

E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

1..7 CURING

A. Protect and cure finished concrete paving in compliance with applicable requirements of Division 3 sections. Use membrane-forming curing and sealing compound or approved moist-curing methods.

1..8 REPAIRS AND PROTECTIONS

A. Repair or replace broken or defective concrete, as directed by Architect.

B. Protect concrete from damage until acceptance of work. 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.

C. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just before final inspection.

1..9 FOR GUARANTEE, See Section 03300.

END OF SECTION 02520

SECTION 02530 - SANITARY SEWERAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Sanitary sewer drainage piping, fittings, accessories and bedding.
2. Connection of project sanitary drainage system to the municipal sanitary sewer system.
3. Manholes, clean-out and access structures.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:
1. Section 02200- Earthwork: Earthwork for utilities.
2. Section 03310 - Cast-In-Place Concrete: Concrete for cleanout and manhole base pads.

1.2 REFERENCES

A. American Association of State Highway and transportation Officials (AASHTO):
1. AASHTO M294 - Corrugated Polyethylene Pipe, Smooth Interior.
2. AASHTO M252 - Corrugated Polyethylene Drainage Tubing.

B. American National Standards Institute (ANSI):
1. ANSI A21.14 - Ductile Iron Fittings, 3-Inch Through 24-Inch, for Gas.

C. American Society for Testing and Materials (ASTM):
1. ASTM C 12 - Practice for Installing Vitrified Clay Pipe Lines.
2. ASTM C 14 - Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
3. ASTM C 76 - Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
4. ASTM C 425 - Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
5. ASTM C 443 - Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
6. ASTM D 3034 - Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
7. ASTM A 746 - Specification for Ductile Iron Gravity Sewer Pipe.
8. ASTM C 700 - Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength and perforated.
9. ASTM F 477 - Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.3 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
1. Product Data: Data for each type of pipe and pipe accessory specified.

2. Assurance/Control Submittals:
   a. Certificates: Manufacturer's certificate certifying that Products meet or exceed specified requirements and standards.

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
1. Project Record Documents: Accurately record the following.
   a. Actual locations of pipe runs, connections, manholes, cleanouts, and invert elevations.
   b. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Perform work in accordance with utility company requirements and applicable health codes and authority having jurisdiction requirements.

PART 2 PRODUCTS

2.1 PIPE MATERIALS

A. Polyvinyl Chloride (PVC) Pipe:
1. ASTM D 3034, Rated SDR 35 unless otherwise required by local utility having jurisdiction. Continuously mark pipe with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification.
2. ASTM D 3034, Table 2; pipe joints with integrally molded bell ends and factory supplied elastomeric gaskets and lubricant.

B. Corrugated Polyethylene (CPP) Pipe:
1. Pipe: AASHTO designation #M294 and #M252; smooth interior, 4 inches through 18 inches as indicated on Drawings.
2. Fittings: ASTM D 3034, rated SDR 35; with thermo-molded PVC.
3. Gaskets: ASTM F 477; with thermo-molded PVC fittings and CPP pipe joint assembly.

C. Vitrified Clay (VCP) Pipe:
1. Pipe: ASTM C 700.
2. Joints: ASTM C 425.
3. Gaskets: ASTM C 425; high grade vulcanized elastomeric compound consisting of basic natural or synthetic rubber. Provide gaskets manufactured in compliance with Rubber Manufacturer's Association tolerances for gaskets.
4. Lubricant: Suitable for lubricating joint components; no deteriorating effects on gasket or pipe material, will not support growth of fungi or bacteria, and of type recommended by gasket manufacturer.

D. Ductile Iron Pipe:
1. Pipe: ASTM A 746; Extra Heavy type, inside nominal diameter as indicated on Drawings with bell and spigot end.
2. Pipe Joint: ANSI A21.14, rubber gasket joint devices.

E. Concrete Pipe:
1. Pipe: ASTM C 14, Class 1, 2, or 3; bell and spigot pipe with inside nominal diameter as indicated on Drawings.
2. Pipe Joint: ASTM C 443; rubber compression gasket joint devices.

F. Reinforced Concrete Pipe:
   1. Reinforced Concrete: ASTM C 76, Class I, II, III, IV, or V as indicated on Drawings, with Wall type A, B, or C; mesh reinforcement; inside nominal diameter as indicated with bell and spigot end.
   2. Reinforced Concrete: ASTM C 443; rubber compression gasket joint devices.

2.2 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene-ribbed gasket for positive seal.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

C. Trace Wire: Magnetic detectable conductor, clear brightly colored plastic covered, imprinted with "SEWER SERVICE" in large letters.

2.3 CLEANOUTS AND MANHOLES

A. Lid and Frame: Heavy-duty cast iron with removable lid as indicated on Drawings.

B. Shaft Construction: Cast Iron shaft of internal diameter as indicated on Drawings with 2500 psi concrete collar for cleanouts.

C. Base Pad: Concrete specified in Section 03310.

D. Manholes: Reinforced precast concrete, in accordance with ASTM C 478 with gaskets in accordance with ASTM C 923. Minimum 4’ clear inside diameter.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify trench cut, excavations, dimensions, and elevations are as indicated on Drawings.

C. Report in writing to Contracting Officer prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the United States Postal Service.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter, which could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 02200 for work of this Section.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth, each layer. Place compacted bedding material to elevation of paving subgrade as indicated on Drawings.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

D. Remove excess backfill and excavated material from site.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM C 12, ASTM C 14, manufacturer's published instructions and state or local requirements. Seal joints watertight.

B. Install pipe on minimum 4 inch bedding as specified in Section 02200.

C. Lay pipe to slope gradients indicated on Drawings.

D. Refer to Section 02200 for trenching requirements. Do not displace or damage pipe when compacting.

E. Connect to building sanitary sewer outlet and municipal sewer system as indicated on Drawings.

F. Install trace wire continuous over top of pipe buried 6 inches below finish grade, above pipe line.

3.5 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to elevation indicated on Drawings.

B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe to be placed at required elevations.

C. Mount lid and frame level in grout, secured to top section at elevation indicated.

3.6 SERVICE CONNECTIONS

A. Coordinate the Work with termination of sanitary sewer connection outside building including connection to municipal sanitary sewer system.

B. Connect to existing municipal sanitary sewer system in compliance with utility requirements for new service connections.

3.7 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field testing and inspection.

B. Site Tests:
   1. Perform inspections prior to and immediately after placing bedding.
   2. Compaction: Specified in Section 02200.
      a. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
      b. Frequency of Tests: One test for each 50 lineal feet of trench.

   3. Perform the following tests in accordance with applicable local Public Works Department Standard Specifications and requirements.
      a. Pressure Test.
      b. Infiltration Test
      c. Deflection Test

END OF SECTION 02530

SECTION 02630 - STORM DRAINAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Site storm sewer drainage piping, fittings and accessories, and bedding.
   2. Connection of storm sewer system to municipal storm sewer system.
   3. Catch basins, manholes, paved area drainage, site surface drainage, and storm water detention facilities.

B. Related Documents: The Contract Documents, as defined in the General Conditions, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:
   1. Section 02200 - Excavation and Fill: Earthwork for utilities.
   2. Section 02530 - Sanitary Sewerage: Site sanitary sewer system.
   3. Section 03310 - Cast-In-Place Concrete: Concrete for catch basins, inlets, and junction boxes.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 760 - Specification for Pipe, Corrugated Steel, Zinc Coated, (Galvanized).
   2. ASTM C 12 - Practice for Installing Vitrified Clay Pipe Lines.
   3. ASTM C 76 - Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
   4. ASTM C 443 - Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
   5. ASTM D 2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
   6. ASTM D 3034 - Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

1.3 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to start of backfill operations.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
   1. Product Data: Data indicating pipe, pipe accessories, and fittings.
   2. Assurance/Control Submittals:
      a. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.
      b. Certificates: Manufacturer's certificate that products meet or exceed specified ASTM requirements.

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
   1. Project Record Documents: Accurately record the following.
      a. Actual locations of pipe runs, connections, manholes, catch basins, cleanouts, and invert elevations.
      b. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Conform to local Public Works Standard Specifications for materials and installation of the work of this Section.

PART 2 PRODUCTS

2.1 PIPE MATERIALS

A. Reinforced Concrete Pipe:
   1. Pipe: ASTM C 76, Class III unless indicated otherwise on Drawings.
   2. Gaskets: ASTM C 443; rubber compression gaskets installed in accordance with manufacturer's published instructions.

B. Corrugated Steel Pipe:
   1. Pipe: ASTM A 760; galvanized, aluminized or bituminous coated round pipe, arch pipe, or slotted drain pipe as indicated on Drawings, 16 gage unless otherwise indicated.
      a. Provide slotted drain pipe with 1.75 inch wide drain guide waterway openings and 6 inch minimum height drain guide.
   2. Fittings:
      a. Matching band connectors.
      b. Sleeve gaskets in accordance with manufacturer's recommendations.

C. Spiral Rib Metal Pipe:
   1. Pipe: ASTM A 760, Type 1R; Galvanized, aluminized or bituminous coated as indicated on Drawings.
   2. Fittings: Provide re- corrugated pipe ends with semi-corrugated Hugger-type bands and "O" ring gaskets in accordance with manufacturers recommendations.

D. Polyvinyl Chloride (PVC) Pipe:
   1. Pipe: ASTM D 3034, SDR 35 Rated.
      a. Continuously mark pipe with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification.
   2. Joints: ASTM D 3034, Table 2; integrally molded bell ends with factory supplied elastomeric gaskets and lubricant.

E. Corrugated High Density Polyethylene (HOPE) Pipe: (OPTIONAL)
   1. Pipe: ASHTO designation #M294 and #M252. H-20 traffic load bearing capability, smooth interior. Double wall profile. Size as indicated on plans; or provide 24 inch diameter, if no size is indicated.
   2. Fittings: Gravity flow, water-tight couplers and adapters.

2.2 MANHOLES, INLETS, CATCH BASINS AND JUNCTION BOXES

A. Lid and Frame: Cast iron as indicated on Drawings.

B. Structure: As indicated on Drawings.

C. Concrete: Specified in Section 03310.

D. Precast Concrete Boxes: Reinforced precast concrete, in accordance with ASTM C 478, with gaskets in accordance with ASTM C 923.

E. Precast Concrete Manholes: Reinforced precast concrete, in accordance with ASTM C 923. 4' clear minimum inside diameter.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify that survey benchmark and intended elevations for the Work are as indicated on Drawings.
   2. Verify that trench cut and excavation is ready to receive Work and excavations, dimensions, and elevations are as indicated on Drawings.

C. Report in writing any prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the owner.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter, which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench as specified in Section 02200. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layers not exceeding 6 inches compacted depth, each layer. Place compacted bedding material to elevation of paving subgrade as indicated on Drawings. Follow pipe manufacturer's recommendations.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

D. Remove excess backfill and excavated material from site.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories of the size and type indicated on the Drawings in accordance with ASTM C 12, ASTM D 2321 or manufacturer's published instructions, and state or local requirements. Seal joints watertight.

B. Install pipe on minimum 4 inch bedding as specified in Section 02200.

C. Lay pipe to slope gradients indicated on Drawings.

D. Install aggregate at sides and over top of pipe. Provide top cover to minimum compacted thickness equal to paving subgrade indicated on Drawings.

E. Refer to Section 02200 for trenching requirements. Do not displace or damage pipe when compacting.

F. Connect to municipal storm sewer systems, manholes, and inlets as indicated on Drawings.

3.5 INSTALLATION – MANHOLES, CATCH BASINS, INLETS, AND JUNCTION BOXES

A. Form bottom of excavation clean and smooth to elevation indicated on Drawings.

B. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe to be placed at required elevations.

C. Form and place cast-in-place concrete walls, sleeved at required elevation, to receive storm sewer pipe as indicated on Drawings.

D. Form and place cast-in-place top of structure as indicated on Drawings.

E. Mount grate and frame level, in grout, secured to top section at elevation indicated.

3.6 CONSTRUCTION

A. Interface with Other work: Coordinate the Work with termination of storm sewer connection outside building including connection to municipal storm sewer system.

3.7 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field inspection and testing.

B. Site Tests:
   1. Perform inspections prior to and immediately after placing bedding.
   2. Compaction:
      a. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
      b. Frequency of Tests: One test for each 50 lineal feet of trench.

3. Perform the following tests in accordance with applicable local Public Works Department Standard Specifications and requirements.
   a. Pressure Test.
   b. Inflation Test.
   c. Deflection Test.

C. Testing to be provided and paid for by the General Contractor.

END OF SECTION 02630

SECTION 02720 - STORM SEWAGE SYSTEMS

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. Install dry sumps as indicated on drawings.

B. Install catch basins as indicated on drawings.

1..3 SUBMITTALS

A. Submittals: Submit manufacturer's technical product data and installation instructions for piping and products. Submit shop drawings for storm sewage systems, and maintenance data. Submit record drawings at project closeout.

1..4 QUALITY ASSURANCE

A. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of storm sewage system's materials and products.

B. Environmental Compliance: Comply with applicable portions of local Environmental Agency regulations pertaining to storm sewage systems.

PART 2 - PRODUCTS

2..1 PIPES AND PIPE FITTINGS:

A. Provide pipes of the following materials. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

1. Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe: ASTM D 2751, SDR 35 for 3", 4", and 6"; and SDR 42 for 8", 10", and 12"; ABS fittings, ASTM D 2751, solvent cement joints complying with ASTM D 2235; or elastomeric joints complying with ASTM D 3212 using gaskets complying with ASTM F 477.

   a. Install in accordance with manufacturer's installation recommendations.

2..2 CATCH BASINS

A. Provide precast reinforced concrete catch basins as indicated.

1. Basin: Precast reinforced concrete, 48" diameter, flat slab top, base riser section with integral floor.
2. Steps: Ductile-iron or aluminum, integrally cast into catch basin sidewalls.
3. Frame and Grate: Ductile-iron, 26" diameter flat grate, heavy duty.
4. Pipe Connectors: Resilient, complying with ASTM C 923.
5. Installation: Construct catch basins to sizes and shapes indicated. Set frames and grates to elevations indicated.
6. Outfalls: Construct of cast-in-place concrete as indicated, with reinforced headwall, apron, and tapered sides. Provide rip-rap as indicated to prevent washout of outfall discharge.

   a. Use concrete, which will attain 28-day compressive strength of not less than 3,000 psi.

2..3 DRYWELLS

A. Provide precast reinforced concrete drywells as indicated, constructed of precast perforated concrete rings, and manhole type cone, with ductile-iron manhole ring and cover.

1. Install as indicated, set on gravel base.
2. Fill: Pack around drywell with 1" to 2" size of crushed rock or gravel, to minimum of 12" beyond drywell perimeter, and full depth of drywell.

PART 3- EXECUTION

3..1 INSTALLATION

A. Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.

B. Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.

C. Lay piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert.

D. Place bell ends or groove ends of piping facing upstream.

E. Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.

F. 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.

1. In large, accessible piping, brushes and brooms may be used for cleaning.

2. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.
3. Flush lines between manholes if required to remove collected debris.

G. Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purpose.

H. Inspect piping to determine whether line displacement or other damage has occurred.

1. Make inspections after lines between manholes, or manhole locations, have been installed and approximately 2-ft of backfill is in place, and again at completion of project.
2. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct such defects, and re-inspect.

I. Backfilling: Conduct backfill operations of open-cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed.

J. Testing: Test and check lines before backfilling to assure free flow. Remove obstructions, replace damaged components, and retest system until satisfactory.

END OF SECTION 02720

SECTION 02753 - CONCRETE PAVEMENT, CURBS AND SIDEWALKS

PART 1 - GENERAL REQUIREMENTS:

1.1 DESCRIPTION:

A. Work Included: Work consists of furnishing all labor, material and equipment necessary for completion of the following work:

1. Formwork, complete with required bracing.

2. Cast-in-place concrete including concrete paving, sidewalks, mow strips, curbs, gutters, and light pole bases.

3. Testing

1.2 QUALITY ASSURANCE:

A. Reference Standards:

1. Perform all cast-in-place concrete work in accordance with "Specifications for Structural Concrete for Buildings," ACI 301-84, unless amended or superceded by requirements of this section or General Notes on the structural drawings.

1.3 DELIVERY, STORAGE, AND HANDLING:

A. Reinforcing: Unload and store reinforcing bars so they will be kept free of mud. Store on timber skids while awaiting use.

B. Concrete:

1. Hauling Time: Discharge all concrete transmitted in a truck mixer, agitator, or other transportation device not later than 1-1/2 hours, or 300 revolutions of the drum after the mixing water has been added, whichever is earliest.

1.4 JOB CONDITIONS:

A. Environmental Requirements:

1. Cold Weather Placement: When depositing concrete after the first frost or when the mean daily temperatures are below 40 degrees F., follow recommendations of ACI 306. Maintain concrete temperature at a minimum of 55 degrees F. for sections having a minimum dimension of less than 12 in., or 50 degrees F. for sections having a minimum dimension of 12 in. or greater, for not less than 72 hours after depositing. The concrete may <u>not</u> contain calcium chloride or admixtures containing more than 0.05% chloride ions or thiocyanates. The specified non-chloride accelerator or high-early strength Type III cement may be used when approved by the Structural Engineer. Do not place concrete without approval of the

Structural Engineer on days when temperature at 9:00 AM is below 30 degrees F. Job cured cylinders for verification of strength and/or the adequacy of the Contractor's protective methods may be required by the Structural Engineer.

2. Hot Weather Placement: When depositing concrete in hot weather, follow recommendations of ACI 305. The temperature of concrete at time of placement shall not exceed 90 degrees F. Protect to prevent rapid drying. Start finishing and curing a soon as possible. When the air temperature is expected to exceed 90 degrees F., the Contractor shall obtain approval from the Structural Engineer of the procedures to be used in protecting, depositing, finishing, and curing the concrete. The specified water reducing retarding admixture may be used upon approval of the Structural Engineer. The use of continuous wetting or fog sprays may be required by the Engineer for 24 hours after depositing or the work may be restricted to evenings or nights, especially in times of low humidity.

B. Protection: Protect newly finished slabs from rain damage. Protect finished slabs from mortar leakage from pouring of concrete above. Cover masonry walls, glazing, and other finish materials with polyethylene or otherwise protect from damage due to pouring of concrete.

PART 2 - PRODUCTS

2.1 GENERAL:

A. All materials in accordance with ACI 301, unless amended or superceded by requirements of following articles or General Notes on the structural drawings.

2.2 CEMENTITIOUS MATERIALS (ACI 301 2.1):

A. General: Unless otherwise specified, use one brand and type of cement throughout the project.

B. Portland Cement: ASTM Cl50 Type I or II.

C. Fly Ash: ASTM C618 Class F.

2.3 ADMIXTURES (ACI 301 2.2):

A. General: Unless specified, no admixtures may be used without specific approval of the Architect.

B. Air Entraining Agent: Conform to ASTM C260. Add air-entraining agent when required as indicated in ACI 301 3.4.1 and as required herein. When required total air content in percent by volume shall be 6 +/- 1.

C. Water Reducing Admixture: Conform to ASTM C494, Type A: Euclid Chemical Company Eucon WR-75; Master Builders Pozzolith 200N; Protex PDA; or equivalent. The admixture shall not contain more chloride ions than are present in municipal drinking water.

D. High Range Water Reducing Admixture (Superplasticizer): Conform to ASTM C494, Type F or G: Euclid Chemical Company Eucon 37; Sika Chemical Corporation Skiament; or equivalent. The

admixture shall not contain more chloride ions than are present in municipal drinking water.

E. Non-Chloride Accelerator: Conform to ASTM C494, Type C or E: Euclid Chemical Company Accelguard 80; W.R. Grace & Co. Darex Set Accelerator; or equivalent. The admixture shall not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer shall have long term test data proving non-corrosive effect on reinforcing steel using an acceptable accelerated corrosion test method.

F. Calcium Chloride: Calcium chloride or admixtures containing more than 0.05% chloride ions or thiocyanates are <u>not</u> <u>permitted</u>.

G. Certification: Written conformance to above mentioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to mix design review by the Structural Engineer.

2.4 AGGREGATES (ACI 301 2.4)

A. Continuously obtain each type aggregate from same source throughout the project. Define proposed gradation of fine and course aggregates for review of Architect with Design Mix Submittal. See section 02528.2.9 below.

2.5 STRENGTH: (ACI 301 3.2):

A. Concrete shall be 4,000 psi. compressive strength, 6 1/2 bag mix w/c = 0.45.

2.6 DURABILITY (ACI 301 3.4):

A. Concrete exposed to weather such as paving, site work, loading docks, and exterior slabs shall meet the requirements of ACI 301 3.4.1.except total air content shall be as noted in 2.03 B. All concrete subject to deicers shall meet the requirements of ACI 301 3.4.3 except total air content shall be as noted in 2.03 B.

2.7 SLUMP (ACI 301 3.5):

A. All Structural Concrete: 4" maximum.

2.8 ADMIXTURES (ACI 301 3.7):

A. All concrete required to be air entrained shall contain an approved air-entraining agent. All concrete shall contain the specified water reducing admixture and/or high range water reducing admixture (Superplasticizer).

2.9 SELECTION OF PROPORTIONS (ACI 301 3.8, 3.9 and 3.11):

A. Mix Design: Cost of concrete mix design by Contractor.

B. Selection of Proportions: Use method of ACI 301 3.9. Proportioning based on method

ACI 301 3.10 not allowed.

1. Field test records used for documentation of the average strength produced by a proposed mix in accordance with ACI 301 3.9.3.2 shall, in addition to the requirements there listed, comply with the following:

    a. The test record shall represent production concrete from a single design mix, produced during the past year, and may be composed of 30 or more consecutive tests.

    b. The test record shall represent concrete made with identical; materials and proportions (including admixtures) to the proposed mix.

    c. The test record shall represent concrete proportioned to produce the maximum slump allowed by these specifications, and for air entrained concrete, within +/- 0.5 percent of the maximum air content allowed.

2. Mixes proportioned on the basis of trial mixtures shall meet the provisions of ACI 301 3.9.3.3.

3. Fly ash, in proportions not greater than 15% by weight of the total amount of cementitious materials, may be used when accepted by the Structural Engineer. Cement content and/or water-cement ratio for mixes containing fly ash shall be based on the total weight of cementitious materials (Portland Cement plus fly ash).

C. Minimum Cement Content: Concrete for slabs-on-grade shall contain a minimum of 520 lbs. of cement per cubic yard of concrete. Concrete for sidewalks shall contain a minimum of 560 lbs. of cement per cubic yard. All other structural concrete shall contain a minimum of 470 lbs. per cubic yard.

2.10 CONCRETE FOR FLOORS (ACI 301 3.14):

A. Requirements of ACI 301 3.14 do not apply.

2.11 CONSTRUCTION JOINT BONDING (ACI 301 6.1.4.3):

A. Cement/water paste or latex or epoxy modified cementitious grout. Adequate cleaning with very high-pressure water or sandblasting and high-pressure water as necessary to provide a clean surface.

2.12 EXPANSION JOINTS (ACI 301 6.2):

A. Asphalt Expansion Joint for Exterior Conditions Only: 1/2" thickness. Conform to ASTM D994.

2.13 BONDING COMPOUND FOR RESURFACING OR REPAIR:

A. Sika Chemical Corp. Sikabond, or equivalent.

2.14 CURING COMPOUND (ACI 301 12.2.1.7):

A. Exterior Slabs, Sidewalks and Curbs: "Crete Cure".

PART 3 - EXECUTION:

3.1 GENERAL:

A. Install concrete work in accordance with ACI 301, paragraphs as listed, unless amended or superceded by following articles or notes on the structural drawings.

B. Use ready mixed concrete conforming to ASTM C94; no job mixed concrete allowed.

C. Special care is required for areas at handicap accessible routs. Comply with USPS RE-4-Handbook.

3.2 INSPECTION:

A. All formwork surfaces that will provide the finish surface of exposed concrete must be approved by the Architect before depositing concrete.

3.3 PREPARATION:

A. Underslab surfaces shall be fine graded to smooth, level surface prior to installation of slab forms.

3.4 FORMWORK (ACI 301, CHAPTER 4):

A. Earth Cuts (ACI 301 4.1): Earth cuts may NOT be used as forms.

3.5 TOLERANCES (ACI 301 4.3)

A. Refer to tolerances listed in table 4.3.1 in ACI 301.

3.6 REPAIR OF SURFACE DEFECTS (ACI 301 CHAPTER 9):

A. Correct or replace concrete not conforming to required lines, details, and elevations.

B. Repair or replace concrete not properly placed resulting in excessive honeycombing and other defects. Repair or replace exposed architectural finished concrete as directed by the Architect.

3.7 FORMED SURFACE FINISHES (ACI 301, CHAPTER 10):

A. Formed surface finishes per ACI 301 10.4. Formed surface finishes as indicated. Provide rough form finish at all covered concrete areas. Provide smooth form finish at all exposed concrete areas. Sidewalks and exterior slabs shall receive a broom finish.

3.8 SCREEDS (ACI 301 11.3):

A. Continuous intermediate screed strips set prior to concrete placement are required. For slabs cast over metal deck, place screeds along beam and joist lines. Set screeds and adjust as necessary to achieve proper slab elevation and thickness, allowing for camber and deflection of supports.

3.9 JOINTING SLABS-ON-GRADE (ACI 301 11.5):

A. Construction Joints: Form joints with specified slab joint form.

B. Control Joints: Construct joints by saw cutting or with specified slab joint form. Make saw cuts as soon as possible after placing concrete without dislodging aggregate to a depth of 1/4 of the slab thickness.

C. Slip Joints: Separate slabs-on-grade from vertical surfaces with specified fiber expansion joint material unless otherwise shown on the drawings.

3.10 SLAB FINISHING TOLERANCES (ACI 301 11.9):

A. Class B. (1/4" in 10'-0")

3.11 CURING (ACI 301 12.1):

A. General: Apply specified curing compounds immediately after final finishing of slabs. Apply in quantities recommended by the manufacturer.

3.12 QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. The Contractor will employ a testing laboratory as approved by the Architect to perform tests and to submit test reports.

B. Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.

C. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

1. Slump: ASTM C 143; one test at point of discharge for each 50 cu. yds. poured of each type of concrete; additional tests when concrete consistency seems to have changed.
2. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each 50 cu. yds. poured of each type of air- entrained concrete.
3. Concrete Temperature: Test hourly when air temperature is 40 deg F (4 deg C) and below, and when 80 deg F (27 deg C) and above; and each time a set of compression test specimens made.
4. Compression Test Specimen: ASTM C 31; one set of 3 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

5. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yds. plus additional sets for each 50 cu. yds.; one specimen tested at 7 days, one specimen tested at 28 days, and one specimen retained in reserve for later testing if required.
6. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
7. When total quantity of a given class of concrete is less than 20 cu. yds., strength test may be waived by Architect if, in his judgement, adequate evidence of satisfactory strength is provided.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
9. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

D. Test results will be reported in writing to Architect, Structural Engineer and Contractor within 24 hours after tests. 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 proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

F. 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 Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

Contractor shall pay for such tests when unacceptable concrete is verified.

3.13 EVALUATION AND ACCEPTANCE CRITERIA (ACI 301 CHAPTER 17 AND 18):

A. Basis of evaluation and acceptance of work under this section shall be in accordance with the provisions of these chapters.

3.14 MISCELLANEOUS CONCRETE REQUIREMENTS:

A. All other concrete work indicated on the drawings shall be provided and installed, even though not specifically mentioned herein, to complete the work, including the following:

1. Anchors: Install anchors furnished in accordance with shop drawings for structural or miscellaneous steel.

2. Light Pole Bases: Form, reinforce, and pour light pole bases as indicated on electrical drawings. Coordinate installation of conduit and anchor bolts with electrical contractor.

3. Exterior slabs shall be formed with slopes as indicated, as directed, or as necessary to

insure proper drainage. Exterior slabs adjacent to building shall drain away from building. Cross slop of sidewalks shall not exceed 1/4" per foot.

3.15 HANDICAP ACCESSIBILITY REQUIREMENTS

A. Areas that do not comply will be removed, re-graded and reconstructed at no cost to the owner.

B. Maximum slope at handicap parking area = 1:50 (2%).

C. Maximum slope at sidewalks = 1:20.

D. Maximum cross slope at sidewalks = 1:50 (2%).

E. Maximum slope at ramps = 1:12.

F. Maximum slope at exterior man doors = 1:50 (2%) for the first 5'-0" (five feet) from door in all directions.

3.16 WARRANTY

TWO (2) YEAR WRITTEN GUARANTEE

Provide two year written guarantee, in form approved by Architect to Owner to promptly remove and/or repair defective concrete, pitting, cracking and spalling, as directed by Architect and at Contractor's expense. New replacement work shall carry a similar new two-year written guarantee. Guarantee shall start from Date of Substantial Completion.

END OF SECTION 02753

SECTION 02765 - PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Painted pavement markings.
   2. Painted curbs, guard posts, and light pole bases.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:
   1. Section 02743 - Bituminous Concrete Paving: Asphalt paving substrate for marking application.
   2. Section 02753 - Plain Cement Concrete Paving: Concrete paving substrate for marking application.

1.2 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
   1. Product Data: Technical data sheets indicating manufacturer's catalog number, paint type description, and VOC content for each paint type specified.
   2. Assurance/Control Submittals:
      1. Certificates: Manufacturer certificate that Products meet or exceed specified requirements.
      2. Test Reports: Manufacturer Material Safety Data Sheets (MSDS) for each paint type specified.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Provide paint materials that conform to Federal, State, and local restrictions for Volatile Organic Compounds (VOC) and lead free content.

1.4 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect products.

B. Deliver paint materials in sealed original labeled containers, bearing manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and/or reducing.

C. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's published instructions.

1.5 PROJECT CONDITIONS OR SITE CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs and warning lights as required.

1.6 MAINTENANCE

A. Section 01780 - Closeout Submittals: Requirements for Closeout Submittals.
   1. Extra Materials:
      a. Provide 1 gallon of each color to owner.
      b. Label each container with color and type, in addition to manufacturer's label.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturers offering specified Products, which may be incorporated into the Work, include the following:
   1. Devoe and Raynolds Company, Louisville, KY (502) 897-9861.
   2. Glidden Coatings and Resins, Cleveland, OH (216) 344-8000.
   3. Sherwin-Williams Company, Cleveland, OH (800) 321-8194.

B. Section 01600 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.2 MATERIALS

A. Ready-mixed; pigments fully ground maintaining a soft paste consistency, capable of readily and uniformly dispersing to a complete homogeneous mixture providing good flowing and brushing properties capable of drying or curing free of streaks or sags. Dry to traffic and touch in 2 hours.

B. Traffic Paint: Flat, Water Base, Acrylic.
   1. 1st Coat:
      a. Devoe: Traffic-Line Interior-Exterior Water Based Traffic Marking Paint, 416XX; MDF 7 mils.
      b. Glidden: Ultra Hide Water based Traffic Paint, MDF 7 mils.
      c. Sherwin-Williams: Setfast Vinyl Acrylic Waterborne Traffic Marking Paint, MDF 7 mils
   2. 2nd Coat:
      a. Devoe: Traffic-Line Interior-Exterior Water Based Traffic Marking Paint, 416XX; MDF 7 mils.
      b. Glidden: Ultra Hide Water based Traffic Paint, MDF 7 mils.
      c. Sherwin-Williams: Setfast Vinyl Acrylic Waterborne Traffic Marking Paint, MDF 7 mils

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing any prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the owner.

3.2 PREPARATION

A. Sweep pavement and surfaces to receive paint markings clean of dust and dirt.

B. Clean surfaces free of glaze and grease, road film, and other foreign materials.

C. Where existing pavement markings are indicated on Drawings to be removed or would interfere with the adhesion of new paint, use a motorized abrasive device to remove existing markings.
   1. Use equipment that will not damage existing paving or create surface hazardous to vehicle or pedestrian traffic.
   2. Use marking removal methods approved by governing authority having jurisdiction in areas within public rights-of-way.

3.3 APPLICATION

A. Apply paint products in accordance with manufacturer's published instructions using application procedures approved for the particular application and substrate to the specified Minimum Dry Film Thickness (MDF). Apply each coat to uniform finish.

B. Do not apply paint markings on surfaces that are not dry and if rain is expected within 24 hours.

C. Do not apply paint markings when surface or air temperature is below 50 degrees F.

D. Apply 2 coats at manufacturer recommended rate without addition of thinner, with maximum 100 square feet per gallon coverage. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use straightedge to provide uniform, clean, and straight stripe.

3.4 PAINT MARKING SCHEDULE

A. Paint the following items with colors indicated below:
   1. Pedestrian Crosswalks: Yellow.
   2. Fire Lanes: Red or per local code.
   3. Lane Striping Where Separating Traffic in Opposite Directions: Yellow.
   4. Lane Striping Where Separating Traffic in Same Direction: White.
   5. Handicap Symbols: Per local code (usually Blue and While).
   6. Parking Stall Striping: Yellow.

END OF SECTION 02765

SECTION 02831 - CHAIN LINK FENCES AND GATES

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. Develop Drawings and Specifications acceptable to the Owner for Placement of Chain Link Fences and Gates.

1..3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1..4 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain chain link fences and gates as complete units, including necessary erection accessories, fittings, and fastenings from a single source or manufacturer.

PART 2 - PRODUCT

1..1 MANUFACTURERS

A. List Available Manufacturers: Subject to compliance with requirements.

1..2 FABRIC

A. Selvage: Fabric 72 inches high and over with 2- or 2-1/8-inch mesh shall be knuckled at one selvage and twisted at the other; all mesh 60 inches high and under shall be knuckled at both selvages.

B. Steel Fabric: Comply with Chain Link Fence Manufacturers Institute (CLFMI) Product Manual. Furnish one-piece fabric widths for fencing up to 12 feet high. Wire size includes zinc or aluminum coating.

1..3 FRAMING

A. Strength requirements for posts and rails conforming to ASTM F 669.

B. Steel Framework, General: Posts, rails, braces, and gate frames.

1..4 FITTINGS AND ACCESSORIES

A. Material: Comply with ASTM F 626. Mill-finished aluminum or galvanized iron or steel, to suit manufacturer's standards.

1..5 GATES

A. Fabrication: Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Space frame members maximum of 8 feet apart unless otherwise indicated.

B. Swing Gates: Comply with ASTM F 900.

PART 3 - EXECUTION

1..1 INSTALLATION

A. General: Install fence in compliance with ASTM F 567. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

END OF SECTION 02831

SECTION 02870 - SITE FURNISHINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete wheel stops.
   2. Downspout splashblocks.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

1.2 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
   1. Product Data: Indicate materials, construction, configuration, dimensions, and finishes.
   2. Assurance/Control Submittals:
      a. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect Products.

PART 2 PRODUCTS

2.1 CONCRETE WHEEL STOPS

A. Manufacturers: Amcor, North Salt Lake, UT 801-936-0800
Buehner Block, Salt Lake City, UT 801-467-5456
Modern Precast, Salt Lake City, UT 801-466-1374

B. Description: pre-cast concrete wheel stop, 6’-0” long, approx. 6” h x 10” w, with min. two (2) holes to dowel stop into pavement.

C. Quantity: Provide and install wheel stops as shown on drawings.

2.2 CONCRETE SPLASHBLOCKS

A. Manufacturers: Confab, Layton, UT 801-544-9054
Modern Precast, Salt Lake City, UT 801-466-1374

B. Description: Pre-cast concrete splashblock, min. 12” x 24” x 3”.

C. Quantity: Provide and install splashblocks as shown on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive work.

C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the United States Postal Service.

3.2 INSTALLATION

A. Install in accordance with manufacturer's published instructions at locations indicated on Drawings. Concrete wheel stops shall be doweled into pavement with min. two (2) #5 bars per stop, with bars extending min. 12” into paving and subsurface. Top of dowels shall not protrude above the top of the wheel stops. Splashblock shall be installed to provide proper drainage away from the building and shall be installed on top of grade to provide drainage away from the splashblock.

END OF SECTION 02870

DIVISION 3 - CONCRETE WORK

Section 03310	**Concrete Work**
Section 03450	**Architectural Pre-cast Concrete**
Section 03600	**Grout**

SECTION 03310 - CONCRETE WORK

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. Extent of concrete work is shown on drawings.

B. Precast concrete is specified in other Division – 3 Section.

C. Concrete bases for mechanical and electrical equipment.

D. Recessed slabs for thick-set floor tile.

E. Testing

1..3 SUBMITTALS:

A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.

B. Shop Drawings; Reinforcement: Submit original 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, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

1. Architect's review is for general architectural applications and features only. Design of formwork for structural stability and efficiency is Contractor's responsibility.

C. Samples: Submit samples of materials as requested by Architect, including names, sources, and descriptions.

1. Provide sample chips of concrete tints. Color to be chosen by Architect from manufacturer’s standard colors.

D. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test.

E. Materials Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Architect. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements. Provide certification from admixture manufacturers that chloride content complies with

specification requirements.

1..4 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. IBC 2006 Edition.
2. ACI 301 "Specifications for Structural Concrete for Buildings".
3. ACI 318-05 "Building Code Requirements for Reinforced Concrete".
4. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".

B. Materials and installed work may require testing and retesting at anytime during progress of work. Retesting of rejected materials for installed work, shall be done at Contractor's expense.

1..5 PROJECT CONDITIONS:

A. Protection of Footings against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.

B. Protect adjacent finish materials against spatter during concrete placement.

1..6 ENVIRONMENTAL REQUIREMENTS

A. Resource Management:
1. Recycled Content:
a. Concrete: Fly ash may be used as a substitute for a maximum of 15 percent of Portland cement.

PART 2 – PRODUCTS

2..1 FORM MATERIALS:

A. Forms for Exposed Architectural Finish Concrete: New medium density overlay forms, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints. A plaster finish will not be acceptable. Simons forms will not be acceptable.

1. 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" to surface.

a. Provide ties which, when removed, will leave holes not larger than 1" diameter in concrete surface.

B. Forms for Exposed Non-Architectural Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form", Class I.

C. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

D. 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.

E. 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 1½" to surface.

1. Provide ties which, when removed, will leave holes not larger than 1" diameter in concrete surface.

2..2 REINFORCING MATERIALS:

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Epoxy-coated reinforcing bars: ASTM A775.

C. Steel Wire: ASTM A 82, plain, cold-drawn steel.

D. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.

E. Supports for Reinforcement: 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 specifications.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
3. For post-tensioned parking slab provide epoxy-coated or plastic coated wire bar supports with a minimum thickness of 0.127 mm.

2..3 CONCRETE MATERIALS:

A. Portland Cement: ASTM C 150, Type II.

B. Use one brand of cement throughout project, unless otherwise acceptable to Architect.

C. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

1. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.
2. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to Architect.

D. Water: Drinkable

E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "Air-Mix"; Euclid Chemical Co.
b. "Sika Aer"; Sika Corp.
c. "MB-VR or MB-AE"; Master Builders.
d. "Darex AEA" or "Daravair"; W.R. Grace.
e. "Edoco 2001 or 2002"; Edoco Technical Products.
f. "Air-Tite"; Gifford-Hill/American Admixtures.

F. Water-Reducing Admixture: ASTM C 494, Type A, and containing not more than 0.1 percent chloride ions.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "WRDA Hycol"; W.R. Grace.
b. "PSI N"; Gifford-Hill/American Admixtures
c. "Eucon WR-75"; Euclid Chemical Co.
d. "Pozzolith Normal"; Master Builders.
e. "Plastocrete 160"; Sika Chemical Corp.
f. "Chemtard"; Chem-Masters Corp.
g. "Pro-Kete-N"; Protex Industries, Inc.

G. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G and containing not more than 0.1 percent chloride ions.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "WRDA 19" or "Daracem"; W.R. Grace.
b. "PSP"; Protex Industries Inc.
c. "Super P"; Anti-Hydro.
d. "Sikament"; Sika Chemical Corp.
e. "Mighty 150"; ICI Americas Corp.
f. "Eucon 37"; Euclid Chemical Co.
g. "PSI Super"; Gifford-Hill.
h. "Rheobuild"; Master Builders.

H. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C 494, Type E, and containing not more than 0.1 percent chloride ions.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "Accelquard 80"; Euclid Chemical Co.
b. "Pozzolith High Early"; Master Builders.
c. "Gilco Accelerator"; Gifford-Hill/American Admixtures

I. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and containing not more than 0.1 percent chloride ions.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "Edoco 20006"; Edoco Technical Products.
b. "Pozzolith Retarder"; Master Builders.
c. "Eucon Retarder 75"; Euclid Chemical Co.
d. "Daratard"; W.R. Grace.
e. "PSI R"; Gifford-Hill/American Admixtures.
f. "Plastiment"; Sika Chemical Co.
g. "Protard"; Protex Industries, Inc.

J. Fly ash: Conform to ASTM C618. The use of a quality fly ash is permitted as a cement-reducing admixture in all other concrete (maximum 15 percent). The fly ash shall meet all of the requirements of ASTM C618, Class F or Class N, with the following special requirements: The loss on ignition in Table 1 shall not exceed 3 percent. Compliance to Table 1A shall apply. The amount retained on the 325 sieve in Table 2 shall not exceed 34 percent. The chemical analysis of the fly ash shall be reported in accordance with ASTM C311. Quality assurance testing and reports for a minimum of six months shall be submitted by the fly ash supplier.

K. Prohibited Admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.1 percent chloride ions are not permitted.

2..4 RELATED MATERIALS:

A. Waterstops: Provide flat, dumbbell type or centerbulb type waterstops at construction joints and other joints as indicated. Size to suit joints.

B. Polyvinyl Chloride Waterstops: Corps of Engineers CRD-C 572.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

a. AFCO Products.
b. The Burke Co.
c. Edoco Technical Products.
d. Greenstreet Plastic Products.
e. Harbour Town Products.
f. W.R. Meadows.

g. Progress Unlimited.
h. Schleigel Corp.
i. Vinylex Corp.

C. Rubber Waterstops: Corps of Engineers CRD-C 513.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

a. The Burke Co.
b. Progress Unlimited
c. Williams Products
d. Edoco Technical Products

D. Granular Base: Evenly graded mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface below slabs on grade.

E. Epoxy Adhesive: ASTM C 881, two component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "Thiopoxy"; W.R. Grace.
b. "Epoxtite"; A.C. Horn, Inc.
c. "Edoco 2118 Epoxy Adhesive"; Edoco Technical Prod.
d. "Sikadur Hi-Mod"; Sika Chemical Corp.
e. "Euco Epoxy 452 or 620"; Euclid Chemical Co.
f. "Patch and Bond Epoxy"; The Burke Co.
g. "Concresive 1001"; Adhesive Engineering Co.

F. Curing compound for colored concrete: Curing compound shall comply with ASTM C309 and be approved by pigment manufacturer for use with colored concrete.

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 in ACI 301. 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.

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. 5000 psi 28-day compressive strength 6-1/2 bag per cubic yard, minimum W/C ratio, 0.40 maximum.
2. 4000 psi 28-day compressive strength 6-bag mix cement per cubic yard, minimum; W/C ratio, 0.45 maximum.
3. 3000 psi 28-day compressive strength 517 lbs. cement per cubic yard, minimum; W/C ratio, 0.50 maximum.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

E. Admixtures:

1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.
2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).
3. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus-or- minus 1-1/2 percent within following limits:

   a. Concrete structures and slabs (all parking slabs) exposed to freezing and thawing, deicer chemicals, or subjected to hydraulic pressure shall have:

      1) 6.5 percent air with 3/4" max. aggregate.

   b. Other Concrete (not exposed to freezing, thawing, or hydraulic pressure): 2 percent to 4 percent air.
4. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

F. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:

1. Subjected to freezing and thawing; W/C 0.50.
2. Subjected to deicers/watertight; W/C 0.45.

G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramps, slabs, and sloping surfaces: Not more than 3".
2. Reinforced foundation systems: Not less than 1" and not more than 3".
3. Concrete containing HRWR admixture (super-plasticizer): Not more than 8" after addition of HRWR to site-verified 2” slump concrete.
4. Other concrete: Not less than 1" nor more than 4".

H. Concrete Flagpole Foundation: Provide concrete composed of portland cement, coarse aggregate, fine aggregate and water, mixed in proportions to attain 28-day compressive strength of not less than 3000 psi. Use not less than 5 sacks of portland cement complying with ASTM C 150, per cubic yard of wet concrete.

2..6 CONCRETE MIXING:

A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.

B. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

C. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

D. Integrally Colored Concrete: NOT USED

PART 3 - EXECUTION

3..1 GENERAL:

A. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

3..2 FORMS:

A. Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic 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. Maintain formwork construction tolerances complying with ACI 347.

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 back-up 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. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

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.

G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

H. 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. Retightening

forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

I. Cut earth is not acceptable form material.

3..3 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. Place all reinforcement in designated position and securely hold in position during the placing and compacting of concrete.

C. Precast concrete block bar supports are only allowed when the concrete is placed in contact with the soil and then only as the support for the bottom mat of bars.

D. Do not tack weld reinforcing bars in place.

E. Do not damage the bars or the epoxy coating during handling and storage.
   1. Use systems with padded contact areas when handling coated bars.
   2. Pad all bundling bands.
   3. Lift all bundles with strong-back, multiple supports, or a platform bridge.
   4. Do not drop or drag bars.

F. Repair damaged bars or coating at no additional cost.

G. Have the coated bars inspected for damage to the coating after the bars are in place and immediately before concrete placement. Repair all visible defects using the specified patching or repair material.

3..4 JOINTS:

A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Architect.

B. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs, and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, except as otherwise indicated.

D. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field
joints in waterstops in accordance with manufacturer's printed instructions.

E. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.

   1. Joint filler and sealant materials are specified in Division-7 sections of these specifications.

F. Contraction (Control) Joints in Slabs-on-Ground: Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8" x 1/4 slab depth or inserts 1/4" wide x 1/4 of slab depth, unless otherwise indicated.

G. Form contraction joints by inserting premolded plastic, hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.

1. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
2. Recess construction joints, new to new, and new to existing. See detail on drawing for dimension of recess. This will be typical at all concrete surfaces to receive tile as the finish surface.

H. If joint pattern not shown, provide joints not exceeding 15' in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third-bays).

1. Joint sealant material is specified in Division-7 sections of these specifications.

3..5 INSTALLATION OF EMBEDDED ITEMS:

A. General: Set and build into work anchorage devices and other 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. Install reglets to receive top edge of foundation sheet waterproofing, and to receive thru-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.

C. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3..6 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, 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 in-place 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..7 CONCRETE PLACEMENT:

A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

1. Apply temporary protective covering to lower 2' of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.

B. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.

C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. 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.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

E. 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 309.

F. 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" 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.

G 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.

H. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

I. 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.

J. Maintain reinforcing in proper position during concrete placement operations.

K. 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.

L. 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.

M. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

N. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

O. 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.

P. 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.

Q. 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.

R. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.

S. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3..8 FINISH OF FORMED SURFACES:

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 1/4" in height rubbed down or chipped off.

B. Smooth Form Finish (Architectural Concrete): For formed concrete surfaces exposed-to-view. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Smooth Rubbed Finish - **Not Acceptable**

D. Smooth Form Finish Dry Stone: Dry stone all exposed foundation walls and tops of foundation walls.

E. Smooth Form Finish Sand Blast: Sand blast exposed concrete areas to a “medium finish” where noted on the drawings as "Architectural Concrete”.

F. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3..9 MONOLITHIC SLAB FINISHES:

A. Trowel Finish: Except for parking slabs, apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry

tile, paint, or other thin film finish coating system.

B. 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 operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of F_F 20 - F_L 17. Grind smooth surface defects which would telegraph through applied floor covering system.

C. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

D. Non-Slip Broom Finish: Apply non-slip broom finish to all exterior parking slabs, exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

E. Chemical Sealer Finish: Apply chemical sealer finish to interior concrete floors to remain exposed.

1. Other Concrete Surfaces: Penetrating sealer - 1 coat at a rate of 150 sq. ft. per gallon. Acrylic sealer - 1 coat, 250 sq. ft. per gallon.

   Manufacturer: Kure-N-Seal - Sonneborn

2. Clean-up: After final coat of chemical sealer solution is applied and dried, remove surplus sealer by scrubbing and mopping with water.

3.10 CONCRETE CURING AND PROTECTION:

A. Class A (1/8" in 10'-0")

3.11 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-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" and sealed by waterproof tape of adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

F. Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walks, and curbs, 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.

G. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Architect.

H. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

I. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

J. Sealer and Dustproofer: Apply a second coat of specified curing and sealing compound only to surfaces given a first coat.

3.12 REMOVAL OF FORMS:

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

C. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.13 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.

3.14 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.

B. Grout base plates and foundations as indicated, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.

3.15 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" 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". 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, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

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. Surface defects, as such, include crazing, cracks in excess of 0.01" 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" 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" 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 same manner as adjacent concrete.

K. Repair isolated random cracks and single holes not over 1/2" in 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. Perform structural repairs with prior approval of Architect or Structural Engineer for method and procedure, using specified epoxy adhesive and mortar.

M. During the last month of the 12 month warranty period, inspect and repair all cracks in the post-tensioned parking slab by epoxy injection.

N. Repair methods not specified above may be used, subject to acceptance of Architect.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. The Contractor will employ a testing laboratory as approved by the Architect to perform tests and to submit test reports.

B. Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.

C. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

1. Slump: ASTM C 143; one test at point of discharge for each 50 cu. yds. poured of each type of concrete; additional tests when concrete consistency seems to have changed.
2. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each 50 cu. yds. poured of each type of air- entrained concrete.
3. Concrete Temperature: Test hourly when air temperature is 40 deg F (4 deg C) and below, and when 80 deg F (27 deg C) and above; and each time a set of compression test specimens made.
4. Compression Test Specimen: ASTM C 31; one set of 3 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
5. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yds. plus additional sets for each 50 cu. yds.; one specimen tested at 7 days, one specimen tested at 28 days, and one specimen retained in reserve for later testing if required.

6. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
7. When total quantity of a given class of concrete is less than 20 cu. yds., strength test may be waived by Architect if, in his judgment, adequate evidence of satisfactory strength is provided.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
9. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

D. Test results will be reported in writing to Architect, Structural Engineer and Contractor within 24 hours after tests. 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 proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

F. 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 Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

Contractor shall pay for such tests when unacceptable concrete is verified.

END OF SECTION 03310

SECTION 03450 - ARCHITECTURAL PRECAST CONCRETE

PART 1 - GENERAL

1..1 DESCRIPTION

A. Work included: Work consists of furnishing all labor, material, and equipment necessary for completion of the following work:

1. Furnish, fabricate, deliver, and install all architectural precast concrete complete with all attaching hardware and accessories, including inserts, anchors, clip angles, dowels, nuts, bolts, washers, and all other accessories indicated on the drawings, specified, or required.
2. Grouting under and between architectural precast concrete after erection.
3. All other work normally related to the above or specified under this section.
4. Note: Those portions of the work specified in this section which are integral to the unit masonry are to be provided under this section and installed as part of the Unit Masonry Specified in Section 04200**.**

B. Related Work:

1. Cast-in-Place Concrete: Section 03310 Concrete Work.
2. Structural Framing: Section 05120 Structural Steel.
3. Caulking of Panel Joints: Section 07900 Sealants
4. Unit Masonry: Section 04200 Unit Masonry

1..2 QUALITY ASSURANCE

A: It is the responsibility of the architectural precast concrete manufacturer to assure that all units are designed to support their own weight, resist any gravity and/or lateral loads, and distribute those loads into the supporting structure of the building.

B: The responsibility for the determination of adequate and proper anchorage of architectural precast concrete shall rest with the precast manufacturer and shall be fully detailed on the shop drawings. Conform to the current Uniform Building Code Edition.

C. Source Quality Control: Quality control of architectural precast concrete products shall be the responsibility of the manufacturer. The Architect and Owner's Testing Agency or his representative shall have access to the manufacturing plant at all times during the manufacture of precast concrete products. The Manufacturer shall cooperate with the Architect and Owner's Testing Agency will inspect panels prior to their leaving the plant.

D. Reference Standards:

1. Precast: Architectural precast units shall conform to "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products: PCI Manual MNL 117, Latest edition.

1..3 SUBMITTAL

A. Samples: Match Architect's sample for each type of finished facing for color and texture prior to starting manufacture. Samples shall be at least 12" by 12" in size, of appropriate thickness and representative of the proposed finished product. One of the approved samples will be returned to the General Contractor and one to the precaster prior to the manufacture.

B. Shop Drawings: Submit shop drawings and setting diagrams for all architectural precast concrete members. Shop drawings shall include connection, anchorage and insert details, size and location of reinforcing steel, member identification marks, and plan layout location and elevation for items to be incorporated into the work of other trades. Identification marks shall appear on the members.

C. Test Reports: The manufacturer shall make available to the Architect and Structural Engineer, upon request, records of concrete cylinder breaks for concrete used in the precast concrete products and mill tests of reinforcing steel used.

1..4 DELIVERY, STORAGE AND HANDLING

A. Store products utilizing good plant procedures and proper handling in such a way as to prevent damage.

B. Use care in transporting architectural precast concrete units to the job site. Handle members in such a manner as to prevent excessive stresses, spalling, or cracking.

PART 2 - PRODUCTS

2..1 ACCEPTABLE MANUFACTURERS

A. Manufacturers include but are not limited to the following:

1. Basic Precast Company
2. Eagle Precast Co
3. Or Prior Approved Equivalent

2..2 MATERIALS

A. All materials shall be in conformance with ACI 318 and applicable ASTM specifications.

1. Concrete: Standard weight concrete having a minimum compressive strength of 4,000 psi at 28 days. Facing mix to consist of graded aggregate mixed with cement and pigment if required to match sample on file in Architect's office in color and texture.
2. Precast concrete sills, lintels and caps at masonry walls are to have a minimum compressive strength of 4,000 PSI at 28 days.

2..3 DESIGN

A. Design: Design of concrete elements shall be in accordance with the Uniform Building Code.
B. Design Loads: The manufacturer shall design his units to accommodate anticipated loading due to handling, erection, and drift.

2..4 FABRICATION AND MANUFACTURE

A. Allowable Tolerances: The dimensions of products shall be as shown on the plans. Products shall be fabricated and furnished to the following tolerances:

1. Length and Width: +3/16 or -1/4" in first 20'. For each additional 10' of length, +/- 1/16".
2. Thickness: -1/8", +1/4".
3. Position of Anchors and Inserts: +/- 1/2" from center line location as shown on drawings.
4. Bowing, Concave or Convex: Any point on a nominally flat unit shall not deviate from a flat surface by more than the length of the unit divided by 360 or 3/4" maximum.
5. Angular Deviations of Plane of Side Mold: 1/32" per 3" depth or 1/16" total, whichever is greater.
6. Out of Square: 1/8" per 6' length or 1/4" total, whichever is greater.
7. Location of Sleeves and Blockouts: +/- 1/2" from indicated centerline location.
8. Length and Width of Blockouts: +/- 1/4".
9. Location of Anchors, Inserts and Embedments: +/- 1" from indicated centerline location.
10. Tolerances on any Dimension not Specified Above: The numerically greater of 1/16" per 10' or +/- 1/8".

B. Architectural Finishes: All exposed surfaces shall match samples on file in Architect's office. Where back of panels are concealed, a broom finish shall be applied. Where backs of panels are exposed, surfaces shall be troweled smooth and suitable for painting without further preparation.

C. Patching: Minor patching in the plant will be acceptable providing the structural adequacy of the product and the appearance is not impaired. Cosmetic patching of architectural finishes will be allowed only after Architect's approval of methods and workmen to be used.

D. Openings: The manufacturer shall provide sleeves or blockouts for those openings 6" or larger shown on drawings. No openings may be field drilled or cut in precast units without prior approval of the Architect and Structural Engineer.

2..5 STEEL PLATES AND ANCHORS

A. All steel anchors, anchor plates and angles which are to be embedded in cast-in-place concrete or built into masonry and are used to attach precast concrete will be provided under this section and installed by the trade responsible for the material in which they are located.

B. All steel cast into architectural precast concrete, plates between sections of panels, and loose steel items shall be provided and installed by the precast subcontractor. Inserts and weld plates shall be located, furnished, and installed by the manufacturer in compliance with information shown on the drawings.

2..6 GROUT

A. Acceptable manufacturers and products:
   1. L & M Construction Chemicals "Crystex".
   2. Master Builders "Master Flow 713".
   3. Protex Industries "Propak".
   4. U.S. Grout Corporation "Five Star Grout".
   5. Euclid Chemical Company "Enco NS".
   6. Or Approved Equal.

PART 3 EXECUTION

3.1 INSTALLATION:

A. General: Installation of architectural precast concrete shall be performed by the precast manufacturer except for precast sills, lintels and caps at masonry walls as noted in Section 4200 Unit Masonry. Members shall be lifted by means of suitable lifting devices at points provided by the fabricator. Temporary shoring and bracing shall comply with the manufacturer's recommendations.

B. Alignment: Align and level members as required by the shop drawings and within allowable tolerances. Level out variations between adjacent members by jacking, loading, or any other feasible method as recommended by the manufacturer and acceptable to the Architect and Structural Engineer. Members must be positioned so that cumulative dimensional errors do not occur.

C. Repair: Cosmetic patching of architectural finishes will be allowed only after Architect's approval of methods and workmen used.

D. Metals: See Article 2.5

E. Erection Tolerances:

   1. Architectural precast units not part of the structural framing: Erect with joints in positions indicated on the drawings and within the following tolerances:

      a. Face width of joints: Drawing dimension +/1 3/16".
      b. Joint taper: 1/40" per foot with a maximum length of tapering in one direction of 10'.
      c. Step in face: 1/4" maximum.
      d. Jog in alignment of edge: 1/4" maximum.
      e. Differential bowing between adjacent members after installation: +/- 1/4".
      f. Warpage after installation: Maximum warpage of one corner from nearest not to exceed 1/16" per foot.

   2. See "Architectural Precast Concrete" Manual for Prestressed Concrete Institute, First Edition, Page 120 and 121, for tolerance definitions and sketches.

F. Grouting: Grout under all precast units. Grout shall be used in strict accordance with manufacturer's recommendations.

3..3 CLEANING

A. Clean all exposed surfaces as necessary to remove dirt and stains which may be on the surfaces after erection. Clean precast units only after all installation procedures are completed. Wash and rinse surfaces in accordance with the precast manufacturer's recommendations.

B. Clean-up after erection shall be the responsibility of the precast subcontractor. Any subsequent clean-up required shall be the responsibility of the General Contractor and the trade involved.

3..4 CAULKING

A. Caulking will be done by the caulking subcontractor after panel cleaning is completed. See Section 07900 Sealants.

END OF SECTION 03450

SECTION 03600 - GROUT

PART 1 - GENERAL

1..1 DESCRIPTION

A. Work included: Work consists of furnishing all labor, material, and equipment for installation of non-shrink grout at the following locations:

1. Under steel column bearing plates.
2. Under steel beam bearings.
3. In erection blockouts, connection blockouts, or pockets.
4. Elsewhere as indicated on the drawings.

B. Related Work:

1. Steel framing and base plates: Section 05120 Structural Steel

1..2 SUBMITTALS

A. Product Data: Submit Catalog Data on Grout Proposed for use.

1..3 DELIVERY, STORAGE AND HANDLING

A. Deliver in original unopened containers and store in a store in a dry place under cover.

1..4 JOB CONDITIONS

A. Environmental Requirements: Maintain temperature of 40 degrees F. or above for at least 72 hours following placement.

PART 2 - PRODUCTS

2..1 NON-SHRINK GROUT OR DRYPACK

A. Acceptable manufacturer and Products:

1. Non-metallic Grout: Use one of the following where grout is exposed to view or weathering:

a. U.S. Grout Corporation "Five Star Grout".
b. Protex Industries "Propak".
c. Master Builders "Master Flow 713".
d. L & M Chemicals "Crystex".
e. Euclid Chemical Company "Euco NS".

f. Or Approved Equal.

B. Grout shall conform to CRD-C-621-80, Corps of Engineers "Specification for Non-Shrink Grout."

C. Minimum Strength: 3,000 PSI

PART 3 EXECUTION

3.1 INSTALLATION:

A. Completely fill with grout under column bearings, erection blockouts, connection blockouts or pockets, and elsewhere as required. Mix, install, and cure grout according to manufacturer's recommendations.

END OF SECTION 03600

DIVISION 4 - MASONRY

Section 04200	**Unit Masonry**
Section 04230	**Reinforced Unit Masonry**
Section 04240	**Artificial Stone**

SECTION 04200 - UNIT MASONRY

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 DESCRIPTION OF WORK:

A. Work Included: Work consists of furnishing all labor, material and equipment necessary for completion of the following work:

1. Concrete unit masonry for veneer and reinforced applications complete with reinforcement and anchorage.
2. Mortar for masonry.
3. Build-in of items supplied by other trades.
4. Cut and fit for other sections of work.
5. Accessory items such as weep holes.
6. Concrete sealer.
7. Testing.

B. Related Work:

1. Caulking of Masonry Control Joints: Section 07900 Joint Sealants.
2. Built-In Door and Window Frames: Section 08100 Metal Doors and Frames.

C. Work Installed but Furnished by Others:

1. Anchor Bolts, Weld Plates and Bearing Plates Built into masonry: Furnished under sections, 03450 Architectural Precast Concrete; 05120 Structural Steel; 05400 Cold Formed Metal Framing; and 05500 Metal Fabrications.
2. Flashings or Flashing Reglets to be built into Masonry: Furnished under Section 07600 Flashing and Sheet Metal.

1..3 QUALITY ASSURANCE:

A. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one

manufacturer for each different product required for each continuous surface or visually related surfaces.

B. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

C. Single Source Responsibility for Integral Water Repellent System: Obtain ingredients of uniform quality from one manufacturer.

D. Field Constructed Mock-Ups: Prior to installation of masonry work, erect sample wall panels to further verify selections made for color and textural characteristics, under sample submittals of masonry units and mortar, and to represent completed masonry work for qualities of appearance, materials and construction; build mock-ups to comply with the following requirements:

1. Locate mock-ups on site in locations indicated or, if not indicated, as directed by Architect.

2. Build mock-ups for the following types of masonry in sizes of approximately 4' long by 4' high by full thickness, including face and back-up wythes as well as accessories.

a. Each type of exposed unit masonry work.

3. Protect mock-ups from the elements with weather resistant membrane.

4. Retain mock-ups during construction as standard for judging completed masonry work. When directed, demolish mock-ups and remove from site.

1..4 SUBMITTALS:

A. Product Data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements. ICBO approval and report are required.

B. Samples for Initial Selection Purposes: Submit samples of the following materials:

1. Unit masonry samples in small scale form showing full extent of colors and textures available for each type of exposed masonry unit required.

2. Colored masonry mortar samples showing full extent of colors available.

1..5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver masonry materials to project in undamaged condition.

B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes.

1. Limit moisture absorption of concrete masonry units during delivery and until time of installation to the maximum percentage specified for Type I units for the average annual relative humidity as reported by the U.S. Weather Bureau Station nearest project site.

C. Store cementitious materials off the ground, under cover and in dry location.

D. Store aggregates where grading and other required characteristics can be maintained.

E. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1..6 PROJECT CONDITIONS:

A. Protection of Work: During erection, cover top of walls with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.

B. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

C. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.

D. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.

E. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry.

F. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.

G. Protect sills, ledges and projections from droppings of mortar.

H. Cold Weather Protection:

1. Do not lay masonry units, which are wet or frozen.

2. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.

3. Remove masonry damaged by freezing conditions.

4. Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout.

5. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10 degrees F (6 degrees C).

a. 40 deg. F (4 deg. C) to 32 deg. F (0 deg. C):

1) Mortar: Heat mixing water to produce mortar temperature between 40 deg. F (4 deg. C) and 120 deg. F (49 deg. C).
2) Grout: Follow normal masonry procedures.

b. 32 deg. F (0 deg. C) to 25 deg. F (-4 deg. C):

1) Mortar: Heat mixing water and sand to produce mortar temperatures between 40 deg. F (4 deg. C) and 120 deg. F (49 deg. C); maintain temperature of mortar on boards above freezing.
2) Grout: Heat grout materials to 90 deg. F (32 deg. C) to produce inplace grout temperature of 70 deg. F (21 deg. C) at end of workday.

c. 25 deg. F (-4 deg. C) to 20 deg. F (-7 deg. C):

1) Mortar: Heat mixing water and sand to produce mortar temperatures between 40 deg. F (4 deg. C) and 120 deg. F (49 deg. C); maintain temperature of mortar on boards above freezing.
2) Grout: Heat grout materials to 90 deg. F (32 deg. C) to produce inplace grout temperature of 70 deg. F (21 deg. C) at end of workday.
3) Heat both sides of walls under construction using salamanders or other heat sources.
4) Use windbreaks or enclosures when wind is in excess of 15 mph.

d. 20 deg. F (-7 deg. C) and below:

1) Mortar: Heat mixing water and sand to produce mortar temperatures between 40 deg. F (4 deg. C) and 120 deg. F (49 deg. C).
2) Grout: Heat grout materials to 90 deg. F (32 deg. C) to produce inplace grout temperature of 70 deg. F (21 deg. C) at end of workday.
3) Masonry Units: Heat masonry units so that they are above 20 deg. F (-7 deg. C) at time of laying.
4) Provide enclosure and auxiliary heat to maintain an air temperature of at least 40 deg. F (4 deg. C) for 24 hours after laying units.

e. Do not heat water for mortar and grout to above 160 deg. F (71 deg. C).

6. Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.

a. 40 deg. F (4 deg. C) to 32 deg. F (0 deg. C):

1) Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.

b. 32 deg. F (0 deg. C) to 25 deg. F (-4 deg. C):

1) Completely cover masonry with weather-resistive membrane for at least 24 hours.

c. 25 deg. F (-4 deg. C) to 20 deg. F (-7 deg. C):

1) Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.

d. 20 deg. F (-7 deg. C) and below:

1) Except as otherwise indicated, maintain masonry temperature above 32 deg. F (0 deg. C) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40 deg. F (4 deg. C) for 48 hours.

PART 2 - PRODUCTS

2..1 CONCRETE MASONRY UNITS:

A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.

1. Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.

a. Provide square-edged units for outside corners at the exterior of the building.

b. Provide bullnose block units at all exposed outside corners on the interior of the building.

B. Concrete Block: Provide units complying with characteristics indicated below for Grade, Type, face size, exposed face and, under each form of block included, for weight classification.

1. Grade N in accordance with UBC Standard No. 24-4, excepting web thickness and web height.

2. Size: Manufacturer's standard units with nominal face dimensions of 16" long x 4" high (15 5/8" x 3 5/8" actual), 16" long x 8" high (15 5/8" x 7 5/8" actual) and 8” long x 8” high (7 5/8” x 7 5/8” actual) x thicknesses indicated.

3. Type I, moisture-controlled units.

a. Cure by autoclave treatment is not required.

4. Exposed Faces: Manufacturer's tinted color unless noted otherwise.

a. Where special finishes are indicated, provide units with exposed faces of the following general description matching color and texture of existing systems.

1) All concrete masonry units to be tinted and split faced on one side and smooth on other three vertical faces unless otherwise indicated.

2) Provide split faced on two sides for corner units.

b. Provide other types of block as called for by plans.

5. Hollow Loadbearing Block: ASTM C90 and as follows:

a. Weight Classification: Lightweight or medium weight.

6. Compressive strength: not less than 1900 psi on net section.

7. Grade 1

8. ASTM C-652

9. Color and texture to match Architect's sample.

2..4 MORTAR AND GROUT MATERIALS:

A. Portland Cement: ASTM C 150, Type I, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color.

B. Masonry Cement: ASTM C 91.

1. For colored pigmented mortars use premixed colored masonry cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations.

a. Available Products: Subject to compliance with requirements, masonry cements which may be incorporated in the work include, but are not limited to, the following:

1) "Atlas Custom Color Masonry Cement"; Lehigh Portland Cement Co.

2) "Flamingo Color Masonry Cement"; The Riverton Corporation.

C. Hydrated Lime: ASTM C 207, Type S.

D. Aggregate for Mortar: ASTM C 144, except for joints less than 1/4" use aggregate graded with 100% passing the No. 16 sieve.

1. White Mortar Aggregates: Natural white sand or ground white stone.

2. Colored Mortar Aggregates: Ground marble, granite or other sound stone, as required to match Architect's sample.

E. Aggregate for Grout: ASTM C 404.

F. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "SGS Mortar Colors", Solomon Grind-Chem Services, Inc.

b. "True Tone Mortar Colors"; Davis Colors, A Subsidiary of Rockwood Industries, Inc.

G. Water: Clean and potable.

2..5 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES:

A. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:
   1. Hot-Dip Galvanized Steel Wire: ASTM A 82 for uncoated wire and with ASTM A 153, Class B-2 (1.5 oz. per sq. ft. of wire surface) for zinc coating applied after prefabrication into units.
   2. Hot-Dip Galvanized Carbon Steel Sheet: ASTM A 366, Class 2 or ASTM A 635; hot-dip galvanized after fabrication to comply with ASTM A 153, Class B.

B. Joint Reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below:

   1. Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 1/2" elsewhere.

   2. Wire Size for Side Rods: 0.1483" diameter.

   3. Wire Size for Cross Rods: 0.1483" diameter.

   4. For single-wythe masonry provide type as follows with single pair of side rods:

      a. Ladder design with perpendicular cross rods spaced not more than 16" o.c.

C. Flexible Anchors: Where flexible anchors are indicated for connecting masonry to structural framework, provide 2-piece anchors as described below which permit vertical or horizontal differential movement between wall and framework parallel to, but resist tension and compression forces perpendicular to, plane of wall.

   1. For anchorage to concrete framework, provide manufacturer's standard anchors with dovetail anchor section formed from 0.1046" (12 gage) thick sheet metal and triangular-shaped wire tie section sized to extend within 1" of masonry face.

   2. For anchorage to steel framework provide manufacturer's standard anchors with crimped 1/4" diameter wire anchor section for welding to steel and triangular-shaped wire tie section sized to extend within 1" of masonry face.

   3. Wire Size: 0.1875" diameter.

D. Rigid Anchors: Provide straps of form and length indicated, fabricated from sheet metal strips of following width and thickness, unless otherwise indicated.

   1. Width: 1-1/4".

   2. Thickness: 3/16".

E. Anchor Bolts: Provide steel bolts with hex nuts and flat washers complying with ASTM A 307, Grade A, hot-dip galvanized to comply with ASTM C 153, Class C, in sizes and configurations indicated.

F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. AA Wire Products Co.

2. Dur-O-Wall, Inc.

3. Heckman Building Products, Inc.

4. Hohmann & Barnard, Inc.

5. Masonry Reinforcing Corp. of America.

6. National Wire Products Corp.

2..6 MASONRY CLEANERS:

A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2 cup dry measure) and laundry detergent (1/2 cup dry measure) dissolved in one gallon of water.

2..7 MORTAR AND GROUT MIXES:

A. General: Do not add admixtures including coloring pigments, air- entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

B. Mixing: Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar required, unless otherwise indicated.

1. Limit cementitious materials in mortar to Portland cement.

2. Use Type S mortar for reinforced masonry and where indicated.

D. Colored Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1-to-10, by weight.

1. Mix to match Architect's sample.

E. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of reinforced and non-reinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement, which will completely fill all spaces intended to receive, grout.

1. Use fine grout in grout spaces less than 2" in horizontal direction, unless otherwise indicated.

2. Use coarse grout in grout spaces 2" or more in least horizontal dimension, unless otherwise

indicated.

2..8 CONCRETE SEALER

A. Penetrating Sealer: Water repellant coating for use over exterior sandblasted concrete, concrete masonry block, vertical pre-cast concrete and interior exposed concrete floors:

1. Dayton Superior: Weather Worker S-20 (20% Silane)
2. Tamms: Baracade Silane 20
3. Sonneborn: Penetrating Sealer 20

B. Penetrating Sealer for precast concrete caps:

1. Dayton Superior Weather Worker S-40 (40% Silane)
2. Sonneborn Penetrating Sealer 40
3. Tamms Baracade Silane 40

PART 3 - EXECUTION

3..1 INSTALLATION, GENERAL:

A. Do not wet concrete masonry units.

B. Cleaning Reinforcing: Before placing, remove loose rust, ice and other coatings from reinforcing.

C. Thickness: Build cavity and composite walls, floors and other masonry construction to the full thickness shown. Build single- wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.

D. Build chases and recesses as shown or required for the work of other trades. Provide not less than 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.

E. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

F. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible.

1. Use dry cutting saws to cut concrete masonry units.

3..2 CONSTRUCTION TOLERANCES:

A. Variation from Plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4" in 10', or 3/8" in a story height not to exceed 20', nor 1/2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20'

maximum, nor 1/2" in 40' or more. For vertical alignment of head joints do not exceed plus or minus 1/4" in 10', 1/2" maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 1/2" in 40' or more. For top surface of bearing walls do not exceed 1/8" between adjacent floor elements in 10' or 1/16" within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2" in any bay or 20' maximum, nor 3/4" in 40' or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" nor plus 1/2".

E. Variation in Mortar Joint Thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8", with a maximum thickness limited to 1/2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

3..3 LAYING MASONRY WALLS:

A. Comply with ICBO Report for Manufacturer's Block with insulation inserts.

B. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.

C. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.

D. Pattern Bond: Lay exposed masonry in the bond pattern shown or, if not shown, lay in running bond with vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less that nominal 4" horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: Rack back 1/2-unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-in Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.

1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

a. At exterior frames insert extruded polystyrene board insulation around perimeter of frame in thickness indicated but not less than 3/4" to act as a thermal break between frame and masonry.

2 Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

3 Fill cores in hollow concrete masonry units with grout 3 courses (24") under bearing plates, beams, lintels, posts and similar items, unless otherwise indicated.

4. Exterior marble tile pieces will be set with epoxy with joint size to match that of the masonry.

3..4 MORTAR BEDDING AND JOINTING:

A. Lay solid brick size masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

B. Lay hollow masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

C. Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.

D. Cut joints flush for masonry walls, which are to be concealed or to be covered by other materials, unless otherwise indicated.

E. Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise indicated.

F. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units, which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

3..5 HORIZONTAL JOINT REINFORCEMENT:

A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 1/2" elsewhere. Lap reinforcing a minimum of 6".

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted to be omitted.

D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

E. Space continuous horizontal reinforcement as noted on drawings:

F. Reinforce masonry openings greater than 1'-0" wide, with one #4 rebar placed in immediately above the lintel, immediately below the sill, and at both jambs. Extend reinforcement a minimum of 2'-0" beyond edges of the opening except at control joints.

1. In addition to wall reinforcement, provide additional reinforcement at openings as required on drawings.

3..6 ANCHORING MASONRY WORK:

A. General: Provide anchor devices of type indicated.

B. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide anchorage shown on drawings.

2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 16" o.c. vertically and 16" o.c horizontally.

3..7 CONTROL AND EXPANSION JOINTS:

A. General: Provide vertical and horizontal expansion, control and isolation joints in masonry where shown or at a maximum of 30' o.c. Build-in related items as the masonry work progresses.

B. Build flanges of metal expansion strips into masonry. Lap each joint 4" in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints, if any.

C. Build flanges of factory-fabricated expansion joint units into masonry. See Division-7 section "Elastic Expansion Joints".

D. Build-in non-metallic joint fillers where indicated.

3..8 LINTELS:

A. Install galvanized steel lintels where indicated.

B. Provide masonry lintels where shown and wherever openings of more than 2'-0" for block size units are shown without structural steel or other supporting lintels.

1. For hollow concrete masonry unit walls, use specially formed U-shaped lintel units with reinforcement bars placed as shown filled with coarse grout.

C. Provide minimum bearing of 8" at each jamb, unless otherwise indicated.

3.9 FIELD QUALITY CONTROL:

A. Contractor will employ separate testing laboratory as selected by Architect, to perform field quality control testing.

3.10 REPAIR, POINTING AND CLEANING:

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.

C. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:

1. Clean unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.

D. Sealing: Provide sealing of concrete masonry unit construction and precast construction in accordance with sealing materials (Section 2..8) manufacturer’s instructions and recommendations and using the best practices of the trade.

E. Protection: Provide final protection and maintain conditions in a manner acceptable to Installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

1. Apply two applications of Miracle Seal 511 Impregnator to all marble surfaces immediately following installation.

END OF SECTION 04200

SECTION 04230 - REINFORCED UNIT MASONRY

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.

B. Requirements of Section "Unit Masonry" apply to work of this section.

1..2 DESCRIPTION OF WORK:

A. Provide Drawings and Specifications acceptable to the owner for the extent of each type of reinforced unit masonry work in the project.

1..3 SUBMITTALS:

A. Mill Certificates: Submit steel producer's certificates of mill analysis, tensile and bend tests for reinforcement steel required for project.

B. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of reinforcement bars. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures". Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.

PART 2 - PRODUCTS

1..1 MATERIALS:

A. General: Refer to Section "Unit Masonry" for masonry materials and accessories not included in this section.

B. Reinforcement Bars: Provide deformed bars of following grades complying with ASTM A 615, except as otherwise indicated.

PART 3 - EXECUTION

1..1 PLACING REINFORCEMENT:

A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or

other causes.

B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1" (whichever is greater).

C. Splice reinforcement bars where shown; do not splice at other points unless acceptable to the Architect. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.

D. Weld splices where indicated. Comply with the requirements of AWS D1.4 for welding materials and procedures.

E. Embed metal ties in mortar joints as work progresses, with a minimum mortar cover of 5/8" on exterior face of walls and 1/2" at other locations.

F. Embed prefabricated horizontal joint reinforcement as the work progresses, with a minimum cover of 5/8" on exterior face of walls and 1/2" at other locations. Lap units not less than 6" at ends. Use prefabricated "L" and "T" units to provide continuity at corners and intersections. Cut and bend units as recommended by manufacturer for continuity at returns, offsets, column fire-proofing, pipe enclosures and other special conditions.

G. Anchoring: Anchor reinforced masonry work to supporting structure as indicated.

1..2 INSTALLATION, GENERAL:

A. Refer to Section "Unit Masonry" for general installation requirements of unit masonry.

B. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.

C. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and all other reasonable temporary loads that may be placed on them during construction.

1..3 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY:

A. General:

B. Walls:

C. Columns, Piers and Pilasters:

D. Grouting:

E. Low-Lift Grouting:

END OF SECTION 04230

SECTION 04240 – ARTIFICIAL STONE

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 DESCRIPTION OF WORK:

A. Provide Drawings and Specifications acceptable to the owner for the extent of artificial stone work in the project. Selection of manufacturer, stone type, stone color(s) and pattern(s) for installation shall be made following submittal of manufacturer's literature and specifications to the architect and owner. No work shall commence until after an on-site pre-installation meeting has been held, to include the general contractor, subcontractor, architect and owner's representative.

1..3 SUBMITTALS:

A. Shop Drawings: Submit shop drawings for type of artificial stone selected.

PART 2 - PRODUCTS

1..1 MATERIALS:

A. Materials may be selected by the architect and owner's representative from samples, product data and specifications, provided by the contractor, from the following sources:

Coronado Stone Products, Inc.
1191 Calabash Avenue
Fontana, CA 92337

Eldorado Stone Corporation
P O Box 489
Carnation, WA 98014
(800) 925-1491

Owens Corning
One Owens Corning Parkway
Toledo, OH 43659
(419) 248-7995

G. S. Harris Co., Inc.
2795 Pennsylvania Avenue
Ogden, UT 84401
(801) 621-1380

Dutch Quality Stone, Inc.
P O Box 308
Mount Eaton, OH 44659
(877) 359-7866

Spalding & Son, Inc dba Rogue River Stone
P O Box 430
Grants Pass, OR 97528
(541) 476-4448

GAF Materials Corporation
1361 Alps Road
Wayne, NJ 07470
(224) 717-9086

Centurion Products Inc.
50 Van Buren Street
Nashville, TN 37208

B. Substitutions and alternates are permitted and may be considered for selection.

PART 3 - EXECUTION

1..1 INSTALLATION:

A. General: Installation shall be in accordance with the manufacturer's recommended procedures and methods. Clean surfaces on which the stone will be installed prior to beginning work. Store materials in original containers on pallets or other surface to prevent staining or water damage.

B. Installer: The contractor installing the artificial stone shall present evidence to the architect and owner that the contractor has at least a 2-year history of installing artificial stone. The architect and owner's representative may require references and/or photographs of previous work accomplished by the subcontractor.

END OF SECTION 04240

DIVISION 5 - METALS

Section 05120	**Structural Steel**
Section 05210	**Steel Joists and Joist Girders**
Section 05310	**Corrugated Metal Deck**
Section 05400	**Cold-formed Metal Framing**
Section 05500	**Metal Fabrications**
Section 05520	**Handrails and Railings**
Section 05710	**Stair Nosings**

SECTION 05120 - STRUCTURAL STEEL

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. Provide, as acceptable to the Owner, drawings and Specifications for the fabrication and erection of structural steel work, including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.

1. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.
2. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.
3. Refer to Division 3 for anchor bolt installation in concrete, Division 4 for anchor bolt installation in masonry.

1..3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

C. Shop drawings prepared under supervision of a licensed Structural Engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.

D. Test reports conducted on shop- and field-bolted and welded connections. Include data on type(s) of tests conducted and test results.

E. Certified copies of each survey conducted by a licensed Land Surveyor, showing elevations and locations of base plates and anchor bolts to receive structural steel and final elevations and locations for major members. Indicate discrepancies between actual installation and contract documents.

1..4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges."

a. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence:

1) "This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any detail configuration of connections developed by the fabricator as a part of his preparation of these shop drawings."

2. AISC "Specifications for Structural Steel Buildings," including "Commentary."
3. "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections.
4. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel."
5. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."

B. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests in the last 12 months.
2. If recertification of welders is required, retesting will be Contractor's responsibility.

1..5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts and nuts become dry or rusty, clean and re-lubricate before use.

PART 2 - PRODUCTS

1..1 MATERIALS

A. Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.

B. Structural Steel Shapes, Plates, and Bars: All wide flange shapes shall be ASTM A992 and miscellaneous shapes shall be ASTM A36.

C. Cold-Formed Steel Tubing: ASTM A500, Grade B.

D. Steel Pipe: ASTM A501 Grade B.

E. Steel Castings: ASTM A 27, Grade 65-35, medium-strength carbon steel.

F. Headed Stud-Type Shear Connectors: ASTM A 108, Grade 1015 or 1020, cold-finished carbon steel with dimensions complying with AISC Specifications.

G. Anchor Bolts: ASTM A 307, non-headed type unless otherwise indicated.

H. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
   1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A 325.

I. Electrodes for Welding: Comply with AWS Code.

J. Structural Steel Primer Paint: Fabricator's standard rust- inhibiting primer.

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

L. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621.

1..2 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Fabrication plant shall be certified per AISC in catagories I and II. Provide camber in structural members where indicated.

B. Connections: Weld or bolt shop connections, as indicated.

C. Bolt field connections, except where welded connections or other connections are indicated..

D. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts."

E. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

F. Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.

G. Steel Wall Framing: Select members that are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square, and true members in completed wall framing.

H. Build up welded door frames attached to structural steel framing. Weld exposed joints continuously and grind smooth. Plug-weld steel bar stops to frames, except where shown removable. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches o.c., unless otherwise indicated.

I. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings.

J. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.

K. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

L. Expansion Joints: Provide expansion joints in steel shelf angles when part of structural steel frame; locate at vertical brick expansion joints as indicated on drawings.

1..3 SHOP PAINTING

A. General: Shop-paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches of embedded areas only.
.

B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:

1. SP-3 "Power-Tool Cleaning."

C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1..4 SOURCE QUALITY CONTROL

A. General: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

B. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.

PART 3 - EXECUTION

1..1 ERECTION

A. Surveys: Employ a licensed land surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made or until compensating adjustments to structural steel work have been agreed upon with Architect.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

E. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

F. Level and plumb individual members of structure within specified AISC tolerances.

G. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

H. Splice members only where indicated and accepted on shop drawings.

I. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.

J. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

K. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

L. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint on structural steel is included in Division 9 under painting work.

1..2 QUALITY CONTROL

A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

B. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

D. Testing agency may inspect structural steel at plant before shipment.

E. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.

F. Shop-Bolted Connections: Inspect or test in accordance with AISC specifications.
   1. Verify that gaps of installed Direct Tension Indicators are less than gaps specified in ASTM F 959, Table 2.

G. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Perform visual inspection of all welds.

H. Field-Bolted Connections: Inspect in accordance with AISC specifications.

I. Field Welding: Inspect and test during erection of structural steel as follows:
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Perform visual inspection of all welds.
   3. Perform tests of welds as follows:

a. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
b. Ultrasonic Inspection: ASTM E 164.

END OF SECTION 05120

SECTION 05210 - STEEL JOISTS AND JOIST GIRDERS

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 Drawings and Specifications for the full extent of steel joists and joist girders, including basic layout and type of joists required.

1..3 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of joist and accessories. Include manufacturer's certification that joists comply with SJI "Specifications".

B. Shop Drawings: Submit detailed drawings showing layout of joist units, special connections, joining and accessories. Include mark, number, type, location and spacing of joists and bridging.

1..4 QUALITY ASSURANCE:

A. Provide joists fabricated in compliance with the following, and as herein specified.

B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with American Welding Society "Structural Welding Code," AWS D1.1.

C. Inspection: Inspect joists and girders in accordance with SJI specifications.

D. Performance Test: If required, conduct performance tests in accordance with procedures described in SJI "Recommended Code of Standard Practice".

1..5 DELIVERY, STORAGE AND HANDLING:

A. Deliver, store and handle steel joists as recommended in SJI "Specifications". Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

PART 2 - PRODUCTS

1..1 MATERIALS:

A. Steel: Comply with SJI "Specifications".

B. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular hexagon type, low carbon steel.

C. High-Strength Threaded Fasteners: ASTM A 325 or A 490 heavy hexagon structural bolts with nuts and hardened washers.

D. Steel Prime Paint: Comply with SJI "Specifications".

E. Steel Prime Paint: Manufacturer's standard.

F. Bedding Mortar: For joist ends bearing on concrete or masonry, provide bedding mortar as follows:

1..2 FABRICATION:

A. General: Fabricate steel joists in accordance with SJI "Specification".

B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.

C. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer's standards and requirements of applicable SJI "Specifications" and load tables.

D. Bridging: Provide horizontal or diagonal type bridging for joists and joist girders, complying with SJI "Specifications".

E. Provide bridging anchors for ends of bridging lines terminating at walls or beams.

F. End Anchorage: Provide end anchorages including bearing plates, to secure joists to adjacent construction, complying with SJI "Specifications", unless otherwise indicated.

G. Header Units: Provide header units to support tail joists at openings in floor or roof system not framed with steel shapes.

H. Shop Painting: Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories before application of shop paint.

I. Apply one shop coat of steel prime paint to joists and accessories, by spray, dipping, or other method to provide a continuous dry paint film thickness of not less than 0.50 mil.

PART 3 - EXECUTION

1..1 ERECTION:

A. Place and secure steel joists in accordance with SJI "Specifications", final shop drawings, and as herein specified.

B. Anchors: Furnish anchor bolts, bearing plates, and other devices to be built into concrete and masonry construction.

C. Placing Joists: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.

D. Provide temporary bridging, connections, and anchors to ensure lateral stability during construction.

E. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.

F. Fastening Joists:

END OF SECTION 05210

SECTION 05310 - CORRUGATED METAL DECK

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. Provide Drawings and Specifications acceptable to Owner for steel deck units to be used in floor and roof applications.

1..3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1..4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated:

1. American Iron and Steel Institute (AISI), "Specification for the Design of Cold-Formed Steel Structural Members."
2. American Welding Society (AWS), D1.3 "Structural Welding Code - Sheet Steel."
3. Steel Deck Institute (SDI), "Design Manual for Composite Decks, Form Decks and Roof Decks."

B. Qualification of Field Welding: Use qualified welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS.

1. Welded decking in place is subject to inspection and testing. Owner will bear expense of removing and replacing portions of decking for testing purposes if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.

C. Underwriters' Label: Provide metal floor deck units listed in Underwriters' Laboratories "Fire Resistance Directory", with each deck unit bearing the UL label and marking for specific system detailed.

D. FM Listing: Provide steel roof deck units that have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approval Guide" for "Class I" fire-rated construction.

PART 2 – PRODUCTS

1..1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:

1..2 MATERIALS

A. Steel for Galvanized Metal Deck Units: ASTM A 446, grade as required to comply with SDI specifications.

B. Miscellaneous Steel Shapes: ASTM A 36.

C. Shear Connectors: Headed stud type, ASTM A 108, Grade 1015 or 1020, cold-finished carbon steel, with dimensions complying with AISC specifications.

D. Shear Connectors: Strap type, ASTM A 570, Grade D, hot-rolled carbon steel.

E. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.

F. Galvanizing: ASTM A 525, G60.

G. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

H. Flexible Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.

1..3 FABRICATION

A. General: Form deck units in lengths to span three or more supports, with flush, telescoped, or nested 2-inch laps at ends and interlocking or nested side laps, of metal thickness, depth, and width as indicated.

B. Roof Deck Units: Provide deck configurations that comply with SDI "Specifications and Commentary for Steel Roof Deck."

C. Non-Composite Steel Form Deck: Provide fluted sections of metal deck as permanent forms for reinforced concrete slabs.

D. Roof Sump Pans: Fabricate from single piece of 0.071-inch min. (14 gage) galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3 inches wide. Recess pans not less than 1-1/2 inches below roof deck surface unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field by others.

PART 3 - EXECUTION

1..1 INSTALLATION

A. General: Install deck units and accessories in accordance with manufacturer's recommendations, shop drawings, and as specified herein.

B. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.

C. Align deck units for entire length of run of cells and with close alignment between cells at ends of abutting units.

D. Place deck units flat and square, secured to adjacent framing without warp or deflection.

E. Do not place deck units on concrete supporting structure until concrete has cured and is dry.

F. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.

G. Do not use floor deck units for storage or working platforms until permanently secured.

H. Fastening Deck Units:

I. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.

J. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.

K. Hanger Slots or Clips: Provide UL-approved punched hanger slots between cells or flutes of lower element where floor deck units are to receive hangers for support of ceiling construction, air ducts, diffusers, or lighting fixtures.

L. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units, except where taped joints are required.

M. Roof Sump Pans: Place over openings provided in roof decking and weld to top decking surface. Space welds not more than 12 inches o.c. with at least one weld at each corner.

N. Shear Connectors: Weld shear connectors to supports through decking units in accordance with manufacturer's instructions. Do not weld shear connectors through two layers (lapped ends) of decking units. Weld only on clean, dry deck surfaces.

O. Closure Strips: Provide metal closure strips at open uncovered ends and edges of roof decking and in voids between decking and other construction. Weld into position to provide a complete decking installation.

P. Touch-Up Painting: After decking installation, wire brush, clean, and paint scarred areas, welds, and rust spots on top and bottom surfaces of decking units and supporting steel members.

Q. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

R. Touch-Up Painting: Cleaning and touch-up painting of field welds, abraded areas, and rust spots, as required after erection and before proceeding with field painting, is included in Division 9 under "Painting."

END OF SECTION 05310

SECTION 05400 - COLD FORMED METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Load-bearing and non-load-bearing metal stud wall and partition framing, with anchorage and bracing.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

1.2 REFERENCES

A. American Iron and Steel Institute (AISI)
   1. "Specification for the Design of Cold-Formed Steel Structural Members" .
   2. "Cold-Formed Steel Design Manual" (Latest).

B. American National Standards Institute (ANSI)
   1. ANSI A58.1 - "Roof, Wind and Snow Loads".

C. American Society for Testing and Materials (ASTM):
   1. ASTM A446 - Steel Sheet, Zinc-coated (galvanized) by Hot-Dip Process, Structural (Physical) Quality.
   2. ASTM A570 Hot-Rolled Carbon Steel Sheet & Strip, Structural Quality.
   3. ASTM A525 - Sheet Steel, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements.
   4. ASTM A611 - "Standard Specification for Steel, Cold-Rolled Sheet, Carbon, Structural."
   5. ASTM C955 - "Standard Specification for Lead Bearing Steel Studs, Runners (Track), Bracing, and Bridging."

D. American Welding Society (AWS):
   1. AWS D1.1 - "Structural Welding Code" and D1.3 - "Specifications for Welding Sheet Steel in Structures."
   2. AWS - “Standard Qualification Procedure”.

E. Federal Specification.
   1. FS TT-P-636C - Rust-Inhibitive Paint.

F. Metal Lath/Steel Framing Association (ML/SFA) - "Lightweight Steel Framing Systems Manual," Latest Edition.

1.3 SYSTEM DESCRIPTION

A. Design Requirements: The supplier shall design and/or verify the size and strength of all light gauge cold-formed Metal Framing members and connections in accordance with the ML/SFA Lightweight Steel Framing Systems Manual.
   1. Design shall use the superimposed design loads specified in the "Design Criteria" section of the "Structural General Notes" in the contract drawings.

2. Design shall be based upon information shown on the drawings and specified herein.

3. Additional Design Criteria - ANSI A58.1 or:
   a. Load-bearing live loads:
      1) Load-bearing partitions:
         a) Lateral pressures: 5 psf
      2) Non-load-bearing partitions:
         a) Lateral pressures: 5 psf
      3) Exterior curtain walls:
         a) Maximum allowable deflections with brick masonry veneer:
         b) Calculated on stud capacity alone: 1/360.
         c) Calculated for composite action: 1/600.

4. Design shall conform to: AISI Specification for the Design of Cold-Formed Steel Structural Members. Wall bridging shall be designed to provide resistance to minor axis bending and rotation of wall studs. Designated selected exterior and/or interior walls shall be designed to provide frame stability and lateral load resistance. All connections (member to member, and member to structure) shall be designed and detailed.

5. Qualification of Field Welding: Qualify welding process and welding operators in accordance with AWS “Standard Qualification Procedure”.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
   1. All shop drawings and calculations must bear the seal and signature of an engineer registered in the jurisdiction where project is being constructed.
   2. Product Data:
      a. Manufacturers' literature containing product and installation specifications and details.
   3. Shop Drawings:
      a. Documents illustrating materials, shop coatings, steel thickness, details of fabrication and erection, details of attachment, spacing of fasteners, required accessories and critical installation procedures.
   4. Calculations:
      a. Engineering calculations or data verifying the framing assembly's ability to meet or exceed design requirements as stated here-in and required by local codes, prepared under the supervision of a Professional Engineer.
   5. Assurance/Control Submittals:
      a. Test Reports: Submit the following reports directly to Contracting Officer from Testing Laboratory, with copy to Contractor. Prepare reports in conformance with Section 01450 - Quality Control:
         1) Testing/Inspection reports conducted on shop and field-bolted and welded connections. Include data on type(s) of tests conducted and test results. Note inspection findings.
      b. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
      c. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing Products specified with minimum 5 years documented experience.

2. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience.

B. Pre-Installation Meetings:
1. Convene a pre-installation meeting one week prior to commencing Work of this Section. Notify the Architect and Contracting Officer of the meeting date and time at least 7 days prior.
2. Require attendance of parties directly affecting Work of this Section.
3. Review conditions of operations, procedures and coordination with related Work.
4. Agenda:
   a. Tour, inspect, and discuss conditions of installation of other work including door and window frames and mechanical and electrical work.
   b. Review areas of potential interference and conflicts, and coordinate layout and support provisions for interfacing work.
   c. Review required submittals, both completed and yet to be completed.
   d. Review Drawings.
   e. Review and finalize construction schedule related to cold formed metal framing installation and verify availability of materials, personnel, equipment, and facilities needed to make progress and avoid delays.
   f. Review required inspections, testing, certifying, and material usage accounting procedures.
   g. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.
   k. Review safety precautions relating to operations.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect Products.

B. Protect metal framing units from rusting and damage. Deliver to project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Store off ground in a dry ventilated space or protect with suitable waterproof coverings and protect against mechanical damage to units. Store materials on a flat plane. Any damaged materials shall be removed from the site.

PART 2 PRODUCTS

2.1 MATERIALS

A. All studs and/or joists and accessories shall be of the type, size, gauge and spacing shown on the plans or as required by manufacturer design, if called for. Studs, runners (track), bracing, and bridging shall be manufactured per ASTM Specification C-955.

B. All painted studs, joists and accessories shall be formed from steel that conforms to the requirements of ASTM A-570 or A-611, as set forth in Section 1.2 of the AISI Specification for the Design of Cold-Formed Steel Structural Members (latest edition).

C. All galvanized studs, joists and accessories shall be formed from steel that conforms to the requirements of ASTM A-466, as set forth in Section 1.2 of the AISI Specification for Design of Cold-Formed Steel Structural Members (latest edition).

D. All painted studs, joists and accessories shall be prime-painted with a rust-inhibitive paint, FS TT-P-636C.

E. All galvanized studs, joists and accessories shall have a minimum G-60 coating.

F. All section properties shall be calculated in accordance with the AISI Specification for the Design of Cold-Formed Steel Structural Members (latest edition).

2.2 FABRICATION

A. General: Framing components may be prefabricated prior to erection. Fabricate components plumb, square, true to line and braced against racking with joints welded. Perform lifting of prefabricated components in a manner to prevent damage or distortion.

B. Fastenings: Attach similar components by welding. Attach dissimilar components by bolting, or screw fasteners, as standard with manufacturer.

C. Cutting of steel framing members may be accomplished with a saw or shear. Torch cutting of load carrying members is not permitted.

D. Wire tying of framing components is not permitted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing any prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the owner.

3.2 INSTALLATION AND STUDWALLS

A. Manufacturer's Instructions: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations, unless otherwise indicated.

B. Stud Walls:
   1. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24 inches on center spacing for nail or power- driven fasteners, or 16 inches on center for other types of attachment. Provide fasteners at corners and ends of tracks.
   2. Position studs plumb in runners and space no greater than 16 inches and not more than 2 inches from abutting walls and at each side of openings. Connect studs to upper and lower tracks using self-drilling, screws or welding in accordance with Manufacturer's recommendations such that the connection meets or exceeds the design loads required at that connection.
   3. Brace all studs at mid-height for added strength, stiffness, and fire-stopping.
   4. Construct corners using minimum of three studs. Double studs at door, window, and sidelight jambs. Install intermediate studs above and below openings to match wall stud spacing.

5. Provide deflection allowance below supported horizontal building framing in ceiling or head track for non-load-bearing framing in a method recommended by stud manufacturer.
   a. Where walls and partitions must close out against the deck for smoke and fire separation provide a top track rigidly attached to vertical studs but free to move vertically in a 14 gauge break-formed deep leg track rigidly attached to deck with slack to accommodate structural live load deflections noted on drawings.
   b. Where wall or partition studs pass by the structural deck provide vertical slide clips welded or screw attached to the structural support but do not attach rigidly to studs.

3.3 INSTALLATION: PRE-FABRICATED AND PANELIZED CONSTRUCTION

A. Panels shall be designed to resist construction and handling loads as well as service loads.

3.4 INSTALLATION: NON-PANELIZED (STICK-BUILT) MEMBERS

A. Align track accurately at supporting structure and fasten to structure as shown on shop drawings.

B. Track intersections shall butt evenly.

C. Studs shall be plumbed, aligned, and securely attached to flanges or webs of upper and lower tracks. Axially loaded studs shall be seated squarely in both top and bottom tracks.

3.5 INSTALLATION: JOISTS

A. Joist shall be located directly over bearing studs or a load distribution member shall be provided to transfer loads.

B. Provide web stiffeners where necessary at reaction points, and at points of concentrated loads, as shown on the shop drawings.

C. Bridging, either strap or solid, shall be provided as shown on the shop drawings.

D. Provide additional joists under parallel partitions where the partition length exceeds 1/2 of the joist span.

E. Provide additional joists around all floor/roof openings which are larger than the joist spacing and as noted on the shop drawings.

F. End blocking shall be provided where joist ends are not otherwise restrained from rotation.

3.6 FASTENINGS AND ATTACHMENTS

A. Anchorage of the tracks to the structure shall be with methods designed for the specific application of sheet to that surface. Size, penetration, type and spacing shall be determined by design.

B. Welds shall conform to the requirements of AWS D1.1, AWS D1.3, and AISI Manual Section 4.2. Welds may be butt, fillet, spot, or groove type, the appropriateness of which shall be determined by, and within the design calculations. All welds shall be touched-up using zinc rich paint to galvanized members, and paint similar to that used by the manufacturer for painted members.

C. Steel drill screws shall be of the minimum diameter indicated by the design of that particular attachment detail. Penetration through joined materials shall not be less than 3 exposed threads.

D. Wire tying in structural applications is not permitted.

3.7 CONSTRUCTION

A. Site Tolerances:
   1. Vertical alignment (plumbness) of studs shall be within 1/960th (1/8 inch in 10.0 inches) (3.175mm in 3.048m) of the span.
   2. Horizontal alignment (levelness) of walls shall be within 1/960th (1/8 inch in 10.0 inches) (3.175mm in 3.048m) of their respective lengths.
   3. Spacing of studs shall not be more than ±1/8 inch (3.175mm) from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.
   4. Squareness - Prefabricated panels shall not be more than 1/8 inch (3.175mm) out of square within the length of that panel.

3.8 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field-testing and inspection.
   1. Inspect all work in order to assure strict conformance to the shop drawings at all phases of construction.
   2. All members shall be checked for proper alignment, bearing, completeness of attachments, proper placement, reinforcement, etc.
   3. All attachments shall be checked for conformance with the shop drawings. All welds shall be touched-up in accordance with Section 3.6 - B.
   4. General Inspection of structure shall be completed prior to applying loads to those members.
   5. Inspections where and as required by local codes shall be controlled inspections.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

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 Drawings and Specifications acceptable to the Owner for the following metal fabrications:

1. Rough hardware.
2. Ladders.
3. Loose bearing and leveling plates.
4. Loose steel lintels.
5. Miscellaneous framing and supports for the following:
a. Applications where framing and supports are not specified in other sections.
6. Miscellaneous steel trim.
7. Shelf and relieving angles.
8. Steel Framed Stairs.
9. Pipe bollards.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 5 Section "Structural Steel" for structural steel framing system components.

1..3 DEFINITIONS

A. Definitions in ASTM E 985 for railing-related terms apply to this section.

1..4 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E 985 for structural performance based on testing performed in accordance with ASTM E 894 and E 935.

1..5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for products used in miscellaneous metal fabrications, including paint products and grout.

C. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation

under other sections.

1. Where installed metal fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified professional engineer who was responsible for their preparation.

D. Samples representative of materials and finished products as may be requested by Architect.

E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

F. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

1..6 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.

C. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel," D1.3 "Structural Welding Code - Sheet Steel", and D1.2 "Structural Welding Code - Aluminum."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification in the last 12 months.

D. Engineer Qualifications: Professional engineer licensed to practice in jurisdiction where project is located and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar in material, design, and extent to that indicated for this Project.

1..7 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

1..1 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Steel Tubing: Product type (manufacturing method) and as follows:

D. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

E. Gray Iron Castings: ASTM A 48, Class 30.

F. Malleable Iron Castings: ASTM A 47, grade 32510.

G. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

H. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

I. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

1..2 GROUT AND ANCHORING CEMENT

A. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD- C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

B. Interior Anchoring Cement: Factory-prepackaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Use for interior applications only.

C. Erosion-Resistant Anchoring Cement: Factory-prepackaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

D. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include but are not limited to the following:

E. Products: Subject to compliance with requirements, provide one of the following:

1. Nonshrink Nonmetallic Grouts:
2. Interior Anchoring Cement:
3. Erosion-Resistant Anchoring Cement:

1..3 FASTENERS

A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls and at all locations where treated lumber is used. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

C. Lag Bolts: Square head type, FS FF-B-561.

D. Machine Screws: Cadmium plated steel, FS FF-S-92.

E. Wood Screws: Flat head carbon steel, FS FF-S-111.

F. Plain Washers: Round, carbon steel, FS FF-W-92.

G. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-S-325, Group VIII (anchors, expansion, [nondrilling]), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade 5.

H. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.

I. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

1..4 PAINT

A. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

D. Zinc Chromate Primer: FS TT-P-645.

1..5 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Remove sharp or rough areas on exposed traffic surfaces.

F. Weld corners and seams continuously to comply with AWS recommendations and the following:

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 that no roughness shows after finishing and contour of welded surface matches those adjacent.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

H. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

I. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. 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.

J. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

K. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

1..6 STEEL LADDERS

A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as indicated. Comply with requirements of ANSI A14.3.

B. Siderails: Continuous steel flat bars, 1/2 inch x 2-1/2 inches, with eased edges, spaced 18 inches apart.

C. Bar Rungs: Round steel bars, 3/4-inch diameter, spaced 12 inches o.c.

D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.

E. Support each ladder at top and bottom and at intermediate points spaced not more than 5'-0" o.c. by means of welded or bolted steel brackets.

F. Provide non-slip surface on top of each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.

1..7 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

1..8 LOOSE STEEL LINTELS

A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels for equal bearing of one inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.

D. Galvanize loose steel lintels located in exterior walls.

1..9 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

C. Fabricate support for suspended toilet partitions:

D. Galvanize miscellaneous framing and supports.

1..10 MISCELLANEOUS STEEL TRIM

A. Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work.

B. Galvanize miscellaneous framing and supports in the following locations:
   1. Exterior locations.

1..11 STEEL FRAMED STAIRS

A. General: Construct stairs to conform to sizes and arrangements indicated. Join pieces together by welding, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, railings, newels, balusters, struts, clips, brackets, bearing plates, and other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.

   1. NAAMM Stair Standard: Comply with “Recommended Voluntary Minimum Standards for fixed Metal Stairs” in NAAMM “Metal Stair Manual” for class of stair designated, except where more stringent requirements are indicated:
      a. Commercial class, unless otherwise indicated.

   2. Fabricate treads and platforms of exterior stairs to accommodate slopes to drain in finished traffic surfaces.

B. Stair Framing: Fabricate stringers of structural steel channels, or plates, or a combination thereof, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to strings, newels, and framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.

C. Metal Pan Risers, Subtreads, and Subplatforms: Shape metal pans for risers and subtreads to conform to configuration shown. Provide thicknesses of structural steel sheet for metal pans indicated, but not less than required, to support total design loading.
   1. Form metal pans of uncoated cold-rolled steel sheet.
   2. Directly weld risers and subtreads to stringers; local welds on side of metal pans to be concealed by concrete fill.

1..12 PIPE BOLLARDS

A. Fabricate pipe bollards from Schedule 80 steel pipe.

B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch thick steel plate welded to bottom of sleeve.

1..13 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish metal fabrications after assembly.

1..14 STEEL AND IRON FINISHES

A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process compliance with the following requirements:

   1. ASTM A 153 for galvanizing iron and steel hardware.
   2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

PART 3 - EXECUTION

1..1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

1..2 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. 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 the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

1..3 SETTING LOOSE PLATES

A. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1..4 INSTALLATION OF BOLLARDS

A. Anchor bollards in concrete by means of pipe sleeves preset and anchored into concrete. After bollards have been inserted into sleeves, fill annular space between bollard and sleeve solid with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's directions.

1..5 ADJUSTING AND CLEANING

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.
   1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting" of these specifications.

C. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05520 - HANDRAILS AND RAILINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel pipe handrails.

B. Related Documents: The Contract Documents, as defined in Section 01110 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

1.3 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Design, engineer, fabricate and install handrails and railing systems to comply with requirements of ASTM E 985 for structural performance based on testing performed in accordance with ASTM E 894 and E 935.
   2. Railing assembly, wall rails, and attachments to resist minimum 100 pound lateral force at any point without damage or permanent set.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe: ASTM A 53, Grade B Schedule 40.

B. Rails and Posts: Steel pipe; with welded joints, of sizes and shapes as indicated on Drawings.

C. Fittings: Elbows, T-shapes, wall brackets, escutcheons; machined steel.

D. Mounting on Concrete Floor: Steel sleeves, sized to receive railing post with 1/4 inch clearance.

E. Mounting on Masonry or Concrete Walls: Brackets with anchors for building in masonry.

F. Mounting on Stud Walls: Brackets and anchor plates, predrilled to receive bolts.

G. Splice Connectors: Steel threaded collars.

2.2 FABRICATION

A. Fit and shop assemble sections in largest practical sizes, for delivery to site and installation.

B. Supply components required for secure anchorage of handrails and railings.

C. Fully weld joints. Grind exposed welds smooth and flush with adjacent surfaces.

D. Wake exposed joint butt tight, flush, and hairline.

E. Accurately form components required for anchorage of railings to each other and to building structure.

F. Prime railings which will be exposed.

2.3 FINISH

A. At Building Exterior:
   1. Galvanizing: ASTM A123; provide minimum 2.0 ounces per square foot.
   2. Touch-Up Primer for Galvanized Surfaces: SSPC 20 Type I Inorganic zinc rich.

B. At Building Interior: SSPC 15, Type 1, red oxide.

C. Field paint as specified in Section 09900.

PART 3 EXECUTION

3.2 PREPARATION

A. Furnish items required to be cast into concrete, embedded in masonry, placed in partitions with setting templates, to appropriate Sections.

3.3 INSTALLATION

A. Install in accordance with manufacturer's published instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Anchor railings to structure with anchors in conformance with ASTM E 985.

D. Field weld anchors as indicated on Drawings. Touch-up welds with primer. Grind welds smooth.

E. Insert railing posts in sleeves and pack sleeves with non-shrink grout.

END OF SECTION 05520

SECTION 05710 – STAIR NOSINGS

PART 1 - GENERAL

1..1 RELATED DOCUMENTS:

A. Drawing and general provisions of Contract, including General Conditions, Special Provisions and Division 1 Specification Sections, apply to this Section.

1..2 SUMMARY:

A. This Section includes the following:

1. Stair nosings.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Section 03310 – Concrete Work: For concrete stairs that nosings are to be set in.

1..3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data in form of manufacturer's product specifications, installation instructions, and general recommendations for each type of nosing indicated.
2. Shop drawings showing full extent of nosings; include large-scale details indicating profiles of each type of nosing, splice joints between sections, joinery with other types, special end conditions, anchorages, fasteners, and relationship to adjoining work and finishes. Include description of materials and finishes.
3. Samples for each type of metal finish indicated on metal of same thickness and alloy to be used in work. Where normal color and texture variations are to be expected, include 2 or more units in each set of samples showing limits of such variations.

1..4 QUALITY ASSURANCE:

A. Manufacturer's Instructions: In addition to requirements of these specifications, comply with manufacturer's instructions recommendations for all phases of work, including preparation of substrate, applying materials, and protection of installed units.

B. Single-Source Responsibility: Obtain nosing assemblies from one source from a single manufacturer.

PART 2 - PRODUCTS

2..1 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:

1. American Safety Tread Co., Inc. (800-245-4881)
2. Balco Metalines (800-767-0082)
3. Wooster Products Inc. (800-321-4936)

2..2 MATERIALS:

A. Metals:

1. Aluminum: Clear ASTM B 221, alloy 6063-T6 for extrusions.

a. Protect aluminum surfaces in contact with cementitious materials with zinc chromate primer or chromate conversion coating.

B. Nonmetal Products:

1. Abrasive filler consisting of aluminum oxide and silicon carbide granules in an epoxy matrix, locked into the channels of the extruded aluminum base.

C. Accessories: Manufacturer's standard anchors, fasteners, set screws, spacers, flexible vapor seals and filler materials, drain tubes, adhesive, and other accessories compatible with material in contact, as indicated or required for complete installations.

2..3 FABRICATION:

A. General: Provide nosing assemblies of design, basic profile, materials, and operation indicated. Select units comparable to those indicated. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes directions or abuts other materials.

1. Provide nosings as shown on plans, or equal.

a. TP-3551, by American Safety Tread with continuous extruded anchor at all other treads.

PART 3 - EXECUTION

3..1 PREPARATION:

A. Coordinate and furnish anchorages, setting drawings, templates, and instructions for installation nosing assemblies to be embedded in concrete.

3..2 INSTALLATION:

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for setting assemblies into concrete.

B. Cutting, Fitting and Placement: Perform all cutting, drilling, and fitting required for installation nosings. Install nosing assemblies in true alignment and proper relationship to steps and adjoining finished surfaces measured from established lines and levels. Securely set in place with all required accessories. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches on centers.

C. Continuity: Maintain continuity of nosing assemblies with no splices.

3..3 CLEANING AND PROTECTION:

A. Do not remove strippable protective material until finish work in adjacent areas is complete. When protective material is removed, clean exposed metal surfaces to comply with manufacturer's instructions.

B. Protect from damage from other trades.

END OF SECTION 05710

DIVISION 6 - WOOD AND PLASTICS

Section 06100	**Rough Carpentry**
Section 06200	**Finish Carpentry**
Section 06402	**Interior Architectural Woodwork**

SECTION 06100 - ROUGH CARPENTRY

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 Drawings and Specifications acceptable to the Owner for the rough carpentry for:

1. Wood grounds, nailers and blocking.
2. Wood furring.
   a. Use all fire treated lumber and sheathing where it is concealed, i.e. blocking, backing, roof plates, parapet walls, casework, support, sheathing, fasteners, nails, etc.

B. Architectural woodwork is specified in Section 06402.

1.3 DEFINITIONS:

A. Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated.

1.4 SUBMITTALS:

A. Material Certificates: Where dimensional lumber is provided to comply with minimum allowable unit stresses, submit listing of species and grade selected for each use, and submit evidence of compliance with specified requirements. Compliance may be in form of a signed copy of applicable portion of lumber producer's grading rules showing design values for selected species and grade. Design values shall be as approved by the Board of Review of American Lumber Standards Committee.

1.5 PRODUCT HANDLING:

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1.6 PROJECT CONDITIONS:

A. Coordination: 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.

PART 2 - PRODUCTS

1.1 LUMBER, GENERAL:

A. 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.

B. Inspection Agencies: Inspection agencies and the abbreviations used to reference with lumber grades and species include the following:

1. RIS - Redwood Inspection Service.
2. NLGA - National Lumber Grades Authority (Canadian).
3. SPIB - Southern Pine Inspection Bureau.
4. WCLIB - West Coast Lumber Inspection Bureau.
5. WWPA - Western Wood Products Association.

C. 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.

D. 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.

1.2 DIMENSION LUMBER:

A. For light framing (2" to 4" thick, 2" to 4" wide), provide the following grade and species:

B. For structural light framing (2" to 4" thick, 2" to 4" wide), provide the following grade and species:

C. For structural framing (2" to 4" thick, 5" and wider), provide the following grade and species:

D. For exposed framing lumber provide material complying with the following requirements:

E. For concealed framing lumber provide fire-retardant treatment lumber to comply with AWPA C20 A C27.

F. For framing lumber in contact with concrete or earth provide pressure treated fir or redwood lumber.

1.3 MISCELLANEOUS LUMBER:

A. Provide wood for support or attachment of other work including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown.

B. Moisture content: 15 percent maximum for lumber items not specified to receive wood preservative treatment.

1.4 CONSTRUCTION PANELS:

A. Construction Panel Standards: Comply with PS 1 "U.S Product Standard for Construction and Industrial Plywood" for plywood panels and, for products not manufactured under PS 1 provisions, with American Plywood Association (APA) "Performance Standard and Policies for Structural-Use Panels", Form No. E445.

B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

C. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant treated plywood panels with grade designation, APA C-D PLUGGED INT with exterior glue, in thickness indicated, or, if not otherwise indicated, not less than 15/32".

1.5 MISCELLANEOUS MATERIALS:

A. 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 hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.

1. Where rough carpentry work is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A 153).
2. Where treated lumber is used all J-bolts, nails, staples and other fasteners shall be zinc or galvanized coated in compliance with IBC 2304.9.5.

PART 3 - EXECUTION

1.1 INSTALLATION, GENERAL:

A. 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.

B. Set carpentry work to required levels and lines, with members plumb and true and cut and fitted.

C. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.

D. Countersink nail heads on exposed carpentry work and fill holes.

E. Use common wire nails, except as otherwise indicated. 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.

1.2 WOOD GROUNDS, NAILERS, BLOCKING AND SLEEPERS:

A. 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.

B. 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.

C. Provide permanent grounds of dressed, preservative treated, key-bevelled lumber not less than 1-1/2" wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

1.3 WOOD FRAMING, GENERAL:

A. Anchor and nail as shown, 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.

1.4 INSTALLATION OF CONSTRUCTION PANELS:

A. General: Comply with applicable recommendations contained in Form No. E 30F, "APA Design/Construction Guide - Residential & Commercial", for types of construction panels and applications indicated.

1. Plywood Backing Panels: Nails to supports.

END OF SECTION 06100

SECTION 06200 - FINISH CARPENTRY

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. Supply and install complete Finish Carpentry work as shown on the Drawings and as specified herein. Any carpentry or millwork not covered in Section 06100 - Rough Carpentry or Section 06220 Millwork shall be covered in this section of the Specifications.

1..3 SHOP DRAWINGS:

A. Submit shop drawings of millwork at full size or large scale showing sizes, materials, grain run, methods of construction, connection to adjacent members and installation. Indicate all backing members for installation and all hardware.

1..4 SAMPLES:

A. Submit before fabrication, two (2) completely finished samples of all exposed work specified herein. Wherever possible, samples shall be 12 inches x 24 inches in size.

1..5 GUARANTEE:

A. Per General Conditions.

1..6 MEASUREMENTS:

A. Verify all dimensions shown on Drawings by taking field measurements; proper fit and attachment of all parts is required.

1..7 COORDINATION:

A. Coordinate with all other trades as required to complete work to satisfaction of Architect.

1..8 DELIVERY AND STORAGE:

A. All materials provided shall be protected from the weather while in transit and at the site. When delivered it shall immediately be placed under cover and adequately protected from the weather. Kiln dried material shall not be stored or erected in wet or damp portions of the building.

1..9 STANDARDS:

A. The following standards apply to work of this section except where more stringent requirements are specified herein:

1. Architectural Woodwork Institute (AWI) "Quality Standards", Western Wood Products Association Manual, and American Wood Preservers Association Specifications.

B. 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:

1. Particleboard: ANSI A208.1
2. Formaldehyde Emission Levels: Comply with formaldehyde emission requirements of each voluntary standard referenced below:

a. Particleboard: NPA 8.
b. Hardwood Plywood: HPMA FE.

PART 2 - MATERIALS

2..1 GENERAL:

A. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and patterns as shown, unless otherwise indicated.

B. Moisture Content of Hardwood Lumber: Provide kiln-dried (KD) lumber having a moisture content from time of manufacture until time of installation within the ranges required in the referenced woodworking standard.

C. Lumber for Transparent Finish (Stained or Clear): Use pieces made of solid lumber stock.

D. Lumber for Painted Finish: At Contractor's option, use pieces which are either glued-up lumber or made of solid lumber stock.

2..2 WOOD SPECIES AND MATERIAL:

A. Masonite Tempered Hardboard

B. Plywood: B Grade or better. Douglas Fir or Pine.

C. 3/4" particle board: High Density.

D. Rough-sawn Timbers:

1. Grade one cedar, or better, selected for appearance. Size as indicated in drawings.

E. Redwood soffits and trim.

1. T & G beveled edge soffit boards. 1” x 4” tongue and groove beveled clear heart redwood.

2..3 PLASTIC LAMINATE:

A. Provide laminate as indicated. Except as otherwise indicated, provide general purpose, high pressure laminated plastic complying with NEMA 11 1, 0.062" thick, for exposed plastic work. Provide temporary protection during handling, fabrication and installation consisting of a strippable coating 4 mils thick.

B. Plywood to be treated per Division 6.

C. Glue: Except for special adhesives required for laminating plastics and except as otherwise indicated to be "waterproof" construction, glue joints and laminate wood plies with "water-resistant" glue which will comply with the requirements for Type II plywood, PS 51.

2..4 ITEMS:

A. Finish carpentry items are not necessarily individually described. Miscellaneous items not described shall be furnished and installed in accordance with the intent of the drawings and specifications and as required to complete the work.

B. All casework will be Premium quality per AWI specifications.

PART 3 - EXECUTION

3..1 FABRICATION, GENERAL:

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of cabinets and edges of solid wood (lumber) members less than 1 inch in nominal thickness: 1/16 inch.
2. Edges of rails and similar members more than 1 inch in nominal thickness: 1/8 inch.

C. 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.

D. Factory-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposure, seal edges of cutouts with a water-resistant coating.

3..2 PRIMING:

A. Back-paint all wood surfaces inaccessible and unexposed after installation before delivery with an approved linseed oil and aluminum primer. Prime coat all unfinished metal parts.

3..3 FINISH CARPENTRY INSTALLATION:

A. Do not deliver any completed millwork to the building until the building is closed in and reasonable temperature and humidity levels have been reached and can be maintained. Also, do not deliver any work until all work that could cause damage to the millwork has been completed. Where certain items must be incorporated into the work before completion of this other work, provide adequate coverings and other protection as needed.

B. Work shall be assembled at the mill, insofar as practical, and delivered ready for erection. When it is necessary to cut and fit on the job the material shall be made in accordance with the measurements taken on the job.

C. Exposed surfaces shall be machine sanded where required for finished surfaces.

D. All millwork and casework items shall be fabricated in accordance with the Custom Grade requirements of the AWI Quality Standards, the approved shop drawings and the Contract Drawings.

E. Items to be built-in shall be securely attached to supporting structure or other construction. All connections shall be hidden unless detailed otherwise.

F. Use only hot dip galvanized or aluminum finish or casing nails. Set nails for putty stopping surfaced members. Hammer marks are not acceptable on any exposed finished surface and may be cause for rejection of work by Architect. Anchor finish work and casework securely.

G. 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 manufacture with respect to surfaces, sizes or patterns.

H. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level countertops; and with 1/16" maximum offset in flush adjoining 1/8" maximum offsets in revealed adjoining surfaces.

I. Provide and install other miscellaneous millwork items and related work required to complete work of this section.

J. Prepare all woodwork installed hereunder by cleaning and sanding as required to receive finishes specified in Section 09900 - PAINTING.

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

L. Standing and Running Trim: Install 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.

M. Anchor finish carpentry work to anchorage devices or blocking built-in 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 nail for exposed nailings, countersunk and filled flush with finished surface, and matching final finish where transparent is indicated.

3..4 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION:

A. 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.

B. Clean finish carpentry work on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.

C. Refer to Division-9 sections for final finishing of installed finish carpentry work.

D. Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION 06200

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

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. Provide Drawings and Specifications acceptable to the Owner for the following work:

1. Laminate clad cabinets (plastic-covered casework).
2. Cabinet tops (countertops).

1..3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product and process specified in this section and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

C. Fire-retardant treatment data for material impregnated by pressure process to reduce combustibility. Include certification by treating plant that treated materials comply with requirements.

D. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Apply WIC Certified Compliance Label to first page of shop drawings.

E. Samples for initial selection purposes of the following in form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of material indicated.

F. Product certificates signed by woodwork manufacturer certifying that products comply with specified requirements.

G. Qualification 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 Architects and Owners, and other information specified.

1..4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing architectural woodwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Single-Source Responsibility: Arrange for production by a single firm of architectural woodwork with sequence matched wood veneers.

C. Single-Source Manufacturing and Installation Responsibility: Engage a qualified Manufacturer to assume undivided responsibility for woodwork specified in this section, including fabrication, finishing, and installation.

D. Installer Qualifications: Arrange for installation of architectural woodwork by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.

E. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.

F. Hardware Coordination: Distribute copies of approved scheduled for cabinet hardware specified in Division 8 Section "Finish Hardware" to manufacturer of architectural woodwork; coordinate cabinet shop drawings and fabrication with hardware requirements.

1..5 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1..6 PROJECT CONDITIONS

A. Environmental Conditions: Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

1..1 HIGH PRESSURE DECORATIVE LAMINATE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates, which may be incorporated in the work, include but are not limited to the following: Formica, Wilsonart and Nevamar.

1..2 MATERIALS

A. 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:

1..3 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. 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.

C. Factory-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges of cutouts with a water-resistant coating.

1..4 LAMINATE CLAD CABINETS (PLASTIC-COVERED CASEWORK)

A. Quality Standard: Comply with AWI Section 400 and its Division 400B "Laminate Clad Cabinets."

B. Grade: Custom.

C. AWI Type of Cabinet Construction: Flush overlay.

D. Laminate Cladding: High pressure decorative laminate complying with the following requirements:

E. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers except where located directly under tops.

1..5 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Finish Hardware."

B. Hardware Standard: Comply with ANSI/BHMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BHMA numbers or referenced to this standard.

C. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for BHMA code number indicated.

D. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of ANSI/BHMA A156.9.

1..6 ARCHITECTURAL CABINET TOPS (COUNTERTOPS)

A. Quality Standard: Comply with AWI Section 400 and its Division 400C.

B. Type of Top: High pressure decorative laminate complying with the following:

1..7 FASTENERS AND ANCHORS

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

B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

C. Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

1..8 FACTORY FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

A. Quality Standard: Comply with AWI Section 1500 unless otherwise indicated.

B. General: The entire finish of interior architectural woodwork is specified in this section, regardless of whether factory applied or applied after installation.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

PART 3 - EXECUTION

1..1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

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

C. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

1..2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.

B. Install woodwork 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 (including tops) and with no variations in flushness of adjoining surfaces.

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

D. Anchor woodwork to anchors 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 fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

E. Cabinets: Install 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. Maintain veneer sequence matching (if any) of cabinets with transparent finish.

F. Tops: Anchor securely to base units and other support systems as indicated.

G. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips and by blind nailing on backup strips, splined-connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated.

H. Complete the finishing work specified in this section to whatever extent not completed at shop or before installation of woodwork.

I. Refer to the Division 9 sections for final finishing of installed architectural woodwork.

1..3 ADJUSTMENT AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

1..4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensures that woodwork is being without damage or deterioration at time of Substantial Completion.

END OF SECTION 06402

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

Section 07115	**Sheet Waterproofing**
Section 07200	**Insulation**
Section 07241	**Synthetic Stucco – EIFS**
Section 07311	**Asphalt Shingles**
Section 07322	**Slate Roofing Shingles (Alternate)**
Section 07321	**Roof Tiles**
Section 07410	**Preformed Roofing and Siding**
Section 07511	**Thermoplastic Polyolefin (TPO) Membrane Roofing**
Section 07600	**Flashing and Sheet Metal**
Section 07700	**Roof Specialties and Accessories**
Section 07810	**Insulated Translucent Skyroof System**
Section 07900	**Joint Sealers**

SECTION 07115 - SHEET WATERPROOFING

PART 1 - GENERAL

1..1 RELATED DOCUMENTS:

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

B. See Section 02630 - Storm Sewage Systems for foundation drain system and associated filter fabric.

1..2 SUMMARY:

A. Extent of each type of sheet waterproofing work is indicated on drawings.

1. At planter foundation walls.
2. At all hips, valleys, rake edges and eave edges of metal roofs.
3. At all hips, valleys, rake edges and eave edges of shingle roofs.
4. At retaining walls.
5. Ice and Water Shield at eaves of all roof types.
6. High temperature Ice and Water Shield under all metal roofs.

B. Types of sheet waterproofing specified in this section include the following:

1. Self adhered rubberized asphalt bonded to polyethylene sheet waterproofing.

1..3 SYSTEM PERFORMANCE:

A. Provide sheet waterproofing products which have been produced and installed to establish and maintain watertight continuous seals.

1..4 SUBMITTALS:

A. Product Data: Submit product data and general recommendations from waterproofing materials manufacturer, for types of waterproofing required. Include data substantiating that materials comply with requirements.

1..5 QUALITY ASSURANCE:

A. Manufacturer: Obtain primary waterproofing materials of each type required from a single manufacturer, to greatest extent possible. Provide secondary materials only as recommended by manufacturer of primary materials.

B. Installer: Firm with not less than 3 years of successful experience in installation of waterproofing similar to requirements for this project and which is acceptable to manufacturer of primary waterproofing materials.

1..6 PROJECT CONDITIONS:

A. Substrate: Proceed with work after substrate construction, openings, and penetrating work have been completed.

B. Weather: Proceed with waterproofing and associated work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1..7 SPECIAL PROJECT WARRANTY:

A. Provide written warranty, agreeing to replace/repair defective materials and workmanship. Warranty includes responsibility for removal and replacement of other work which conceals sheet waterproofing.

1. Warranty period is 5 years after date of substantial completion.

PART 2 - PRODUCTS

2..1 MATERIALS:

A. General: Provide sheet waterproofing materials complying with required performance. Other similar materials certified in writing to be equal-to-or-better than specified may be used if acceptable to Architect.

2..2 SHEET WATERPROOFING AT RETAINING WALLS AND PLANTER WALLS (WHEREVER SOIL IS RETAINED ABOVE FLOOR LINE):

A. Provide self-adhering membrane of rubberized asphalt integrally bonded to polyethylene sheeting. Minimum thickness .060.

2..3 SHEET WATERPROOFING AT SLOPED ROOFS:

A. Provide self adhering membrane of rubberized asphalt integrally bonded to polyethylene sheeting. Minimum thickness 40 mils.

B. Provide Ice and Water Shield, minimum thickness 40 mils, manufactured by Grace or approved equal, as shown on drawings.

C. **Under metal roofs (entire metal roof area), provide Grace “Ultra” Ice and Water Shield, minimum thickness 30 mils.** All Ice and Water Shield materials to be installed per manufacturer’s recommendations and guidelines and in accordance with all applicable codes and as shown on drawings.

2..4 THROUGH-WALL FLASHING AT EXTERIOR WALLS:

A. Not required

2..5 AUXILIARY MATERIALS:

A. Adhesives: Provide types of adhesive compound and tapes recommended by waterproofing sheet manufacturer, for bonding to substrate (if required), for waterproof sealing of seams in membrane, and for waterproof sealing of joints between membrane and flashings, adjoining surfaces and projections through membrane.

B. Primers: Provide type of concrete primer recommended by manufacturer of sheet waterproofing material for applications required.

C. Flashing Materials: Except as otherwise indicated, provide types of flexible sheet material for flashing as recommended by waterproofing sheet manufacturer.

D. Protection Course: Provide type recommended by waterproofing sheet manufacturer, unless another type is indicated; include adhesives recommended by manufacturer.

PART 3 - EXECUTION

3..1 PREPARATION:

A. General: Comply with manufacturers instructions for surface preparation.

B. Prior to installation of waterproofing and associated work, meet at project site with Installer of each component of associated work, inspection and testing agency representatives (if any), and installers of work requiring coordination with waterproofing work. Review material selections and procedures to be followed in performing work.

C. On vertical foundation walls chip off projections where necessary for proper placement and adhesion of waterproofing sheet.

D. Apply primer to concrete and masonry surfaces at rate recommended by manufacturer of primary waterproofing materials. Prime only area which will be covered by WP membrane in same working day; reprime areas not covered by WP membrane within 24 hours.

E. Do not advance laying of insulation ahead of waterproofing more than necessary for sequence of operation. Cover insulation exposed at end of day's work (and when rain threatens) with waterproofing materials. Remove and dispose of insulation which has become wet; replace before proceeding with insulating and waterproofing work.

3..2 INSTALLATION:

A. Comply with manufacturer's instructions for handling and installation of sheet waterproofing materials.

B. Coordinate installation of waterproofing materials and associated work to provide complete system complying with combined recommendations of manufacturers and installers involved in work. Schedule installation to minimize period of exposure of sheet waterproofing materials.

C. Extend waterproofing sheet and flashings as shown to provide complete membrane over area indicated to be waterproofed. Seal to projections through membrane and seal seams. Bond to vertical surfaces and also, where shown or recommended by manufacturer, bond to horizontal

surfaces.

D. Top Edge Seal: For vertical and sloped wall membrane, finish in reglet (where provided), otherwise finish under flashing or under masonry in joint. Caulk exposed edges with mastic or sealant.

E. Install protection course over completed membrane, complying with manufacturer's recommendations for both waterproofing sheet and protection course materials.

3..3 CLEANING:

A. After completion, remove any masking materials and stains from exposed surfaces caused by waterproofing installation.

3..4 PROTECTION:

A. Institute required procedures for protection of completed membrane during installation of work over membrane and throughout remainder of construction period. Do not allow traffic of any type on unprotected membrane.

END OF SECTION 07115

SECTION 07200 - INSULATION

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 DESCRIPTION OF WORK:

A. Extent of insulation work is shown on drawings and indicated by provisions of this section.

B. Applications of insulation specified in this section include the following:

1. Foundation wall insulation (supporting backfill).
2. Board-type building insulation, concealed.
3. Blanket-type building insulation.
4. Sound blanket-type building insulation.

C. Loose granular insulation for cavity walls and masonry cells is specified in Division-4 section "Unit Masonry".

D. Expanded polystyrene insulation masonry inserts are specified in Division-4 section "Unit Masonry".

1..3 QUALITY ASSURANCE:

A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by r-values they represent the rate of heat flow through a homogenous material exactly 1" thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

1..4 SUBMITTALS:

A. Product Data: Submit manufacturer's product literature and installation instructions for each type of insulation and vapor retarder material required.

B. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including r-values (aged values for plastic insulations), densities, compression strengths, fire performance characteristics, perm ratings, water absorption ratings and similar properties.

1..5 DELIVERY, STORAGE, AND HANDLING:

A. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

B. Protection for Plastic Insulation:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time. Complete installation and concealment of plastic materials as rapidly as possible in each area of work.

PART 2 - PRODUCTS

1..1 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Manufacturers of Extruded Polystyrene Board Insulation:

a. Amoco Foam Products Co.
b. Dow Chemical U.S.A.
c. Minnesota Diversified Products, Inc.
d. UC Industries.

2. Manufacturers of Glass Fiber Insulation:

a. CertainTeed Corp.
b. Knauf Fiber Glass GmbH.
c. Manville Corp.
d. Owens-Corning Fiberglass Corp.

3. Manufacturers of nailable composite insulation board:

a. NRG Barriers
b. R Max
c. Temple-Inland
d. Thermal Systems

1..2 INSULATING MATERIALS:

A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.

1. Performed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths and lengths.

B. Extruded Polystyrene Board Insulation: Rigid, cellular thermal insulation with closed-cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for Type indicated; with 5-year aged r-values of 5.4 and 5 at 40 and
75 deg. F (4.4 and 23.9 deg. C), respectively; and as follows:

1. Type IV, 1.6 lb./cu. ft. min. density, unless otherwise indicated.

2. Thickness shall be as indicated in drawings.

C. Sound blanket type building insulation: Sound blanket type insulation shall be constructed if inorganic glass fibers.

1. Blanket width to match stud spacing.
2. Dimensional Stability: linear shrinkage less than 0.1%.

D. 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 (blankets with reflective vapor-retarder membrane facing with flame spread of 25 or less); foil-membrane on one face, respectively; and as follows:

1. Mineral Fiber Type: Fibers manufactured from glass.
2. Thickness shall be as indicated in drawings.

1..3 AUXILIARY INSULATING MATERIALS:

A. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer, and complying with requirements for fire performance characteristics.

B. Mechanical Anchors: Type and size indicated or, if not indicated, as recommended by insulation manufacturer for type of application and condition of substrate. Factory mutual approved required for nailable insulation fasteners.

C. Protection Board: Pre-molded, semi-rigid asphalt/fiber composition board, 1/4" thick, formed under heat and pressure, standard sizes. (At foundation insulation)

PART 3 - EXECUTION

1..1 INSPECTION AND PREPARATION:

A. Require Installer to examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate and related work is specified. Obtain Installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

B. Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections which might puncture vapor retarders.

1..2 INSTALLATION, GENERAL:

A. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

1..3 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION:

A. On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions. Use type of adhesive recommended by manufacturer of insulation.

B. Protect insulation on vertical surfaces (from damage during back-filling) by application of protection board. Set in adhesive in accordance with recommendations of manufacturer of insulation.

1..4 INSTALLATION OF GENERAL BUILDING INSULATION:

A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between closed-cell (non-breathing) insulation units by applying mastic or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with mastic or sealant.

C. Set reflective foil-faced units accurately with air space in front of foil as shown. Provide not less than 0.75" air space where possible.

1..5 PROTECTION:

A. General: Protect installed insulation and vapor retarders from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or, where that is not possible, by temporary covering or enclosure.

END OF SECTION 07200

SECTION 07241 - SYNTHETIC STUCCO - EIFS

PART 1 - GENERAL REQUIREMENTS

1..1 RELATED DOCUMENTS:

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

1..2 DESCRIPTION OF WORK:

A. Extent of synthetic stucco work is shown on drawings and indicated by provisions of this section.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 7 Section "Joint Sealers" for sealing joints in system with Elastomeric joint sealants.
2. Work provided by others: Preparation of sandstone substrate to receive prime and finish coat of synthetic stucco.

1..3 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Engage a firm experienced in manufacturing systems that are similar to those indicated for this Project and that have a record of successful in-service performance.

B. Installer Qualifications: Engage an experienced Installer who has completed systems similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

C. Single-Source Responsibility: Obtain materials for system from either a single manufacturer or manufacturers approved by the system manufacturer as compatible with other system components.

1..4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for each component of exterior insulation and finish systems.

2. Samples for initial selection purposes in form of manufacturer's standard color charts and small-scale samples indicating available textural choices.

1..5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original, unopened packages and containers with manufacturer's labels identifying products legible and intact.

B. Store materials inside and under cover; keep them dry and protected from the weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, damage from construction traffic, and other causes.

PART 2 - PRODUCTS

2..1 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering systems that may be incorporated in the work include but are not limited to the following:

1. Manufacturers of Synthetic Stucco System:

a. Bonsal; W.R. Bonsal Co.
b. Dryvit Systems, Inc.
c. ISPO USA, Inc.
d. Pleko Products, Inc.
e. Senergy Inc.
f. Simplex Div., Anthony Industries, Inc.
g. STO Industries, Inc.
h. TEC Inc., an H.B. Fuller Co.
i. Thoro System Products.
j. Vitricon Div., Polymer Plastics Corp.
k. Master Wall, Inc.

2..2 SYSTEM PERFORMANCE REQUIREMENTS:

A. Provide systems complying with the following performance requirements:

1. Bond Integrity: Free from bond failure within system components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
2. Weathertightness: Resistant to water penetration from exterior into system and assemblies behind it or through them into interior of building that results in deterioration of or degradation of system and assemblies behind system including substrates, supporting wall construction, and interior finish.
3. Fire Performance Characteristics: Provide materials and construction that are identical to those tested for the following fire performance characteristics, per test method indicated below, by testing and inspecting organizations acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting organization.
4. Flame Spread of Insulation Board and Finish Coats: 25 or less when tested individually per ASTM E 84.

2..3 MATERIALS:

A. Compatibility: Provide primer and finish coat materials, sealants, and accessories that are compatible with one another and approved for use by system manufacturer.

B. Colors and Textures of Protective Coating: Comply with the following requirements:

1. Provide selections made by Architect from manufacturer's full range of standard colors and textures for type of finish coat indicated.

C. Surface-Primer: System manufacturer's standard concrete primer designed to improve bond between concrete substrate of and synthetic stucco finish coat.

D. Finish Coat Materials: System manufacturer's standard mixture complying with the following requirements for material composition and method of combining materials:

1. Factory-mixed formulation of polymer emulsion admixture, colorfast mineral pigments, sound stone particles, and fillers.

E. Water: Clean and potable.

2..4 ELASTOMERIC SEALANTS:

A. Sealant Products: Provide manufacturer's standard chemically curing, elastomeric sealant that is compatible with joint fillers, joint substrates, and other related materials and complies with requirements of Division 7 Section "Joint Sealers" for products corresponding to description indicated below.

1. Multipart Nonsag Urethane Sealant.

B. Sealant Color: Comply with the following requirement::

1. Match finish coat color of system.

2..5 MIXING:

A. General: Comply with system manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as approved by system manufacturer. Mix materials in clean containers. Use materials within time period specified by system manufacturer or discard.

PART 3 - EXECUTION

3..1 INSPECTION AND PREPARATION:

A. Examine substrates, with Installer present, to determine if they are in satisfactory condition for installation of system. Do not proceed with installation of system until unsatisfactory conditions have been corrected.

B. Protect contiguous work from moisture deterioration and soiling resulting from application of systems. Provide temporary covering and other protection needed to prevent spattering of exterior finish coatings on other work.

C. Protect system, substrates, and wall construction behind them from inclement weather during installation. Prevent infiltration of moisture behind system and deterioration of substrates.

D. Substrate Preparation:

1. Apply surface primer over concrete substrate to improve adhesion.

3..2 PROJECT CONDITIONS:

A. Environmental Conditions: Do not install system when ambient outdoor temperatures are 40 deg F (4 deg C) and falling unless temporary protection and heat are provided to maintain ambient temperatures above 40 deg F (4 deg C) during installation of wet materials and for 24 hours after installation or longer to allow them to become thoroughly dry and weather resistant.

3..3 SEQUENCING AND SCHEDULING:

A. Sequence installation of system with related work specified in other sections to ensure that wall assemblies, including flashing, trim, and joint sealers, are protected against damage from weather, aging, corrosion, and other causes.

3..4 INSTALLATION:

A. General: Comply with system manufacturer's current published instructions for installation of system as applicable to each type of substrate indicated.

B. Apply primer coat to exposed concrete surfaces in minimum thickness specified by system manufacturer.

C. Apply finish coat over dry primer coat in thickness required by system manufacturer to produce a uniform finish of texture and color matching approved sample.

3..5 INSTALLATION OF JOINT SEALANTS:

A. Prepare joints and apply sealants, of type and at locations indicated, to comply with applicable requirements of Division 7 section "Joint Sealers" and with "EIMA Joint Sealant Specifications for Exterior Insulation and Finish Systems."

3..6 CLEANING AND PROTECTION:

A. Remove temporary covering and protection of other work. Promptly remove protective coatings from window and door frames and any other surfaces outside areas indicated to receive protective coating.

B. Provide final protection and maintain conditions in a manner acceptable to Installer and system manufacturer that ensures system's being without damage or deterioration at time of Substantial Completion.

END OF SECTION 07241

SECTION 07311 - ASPHALT SHINGLES

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.

B. Also see Section 07115 - Sheet Waterproofing

1.2 DESCRIPTION OF WORK:

A. Extent of shingles is indicated on drawings and is hereby defined to include units employed as weather protection for walls as well as for steep roofs.

1.3 QUALITY ASSURANCE:

A. UL Listing: Provide labeled materials which have been tested and listed by UL for Class and Rating indicated for each shingle type required.

1.4 SUBMITTALS:

A. Product Data: Submit technical product data, installation instructions and recommendations from shingle manufacturer, including data that materials comply with requirements.

B. Samples: Submit full range of samples for color and texture selection. After selection, submit 2 full-size shingles for verification of each color/style/texture selected.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials in manufacturer's unopened, labeled bundles, rolls or containers.

B. Store materials to avoid water damage, and store rolled goods on end. Comply with manufacturer's recommendations for job-site storage and protection.

1.6 JOB CONDITIONS:

A. Substrate: Proceed with shingle work only after substrate construction and penetrating work have been completed.

B. Weather Conditions: Proceed with shingle work only when weather conditions are in compliance with manufacturer's recommendations and when substrate is completely dry.

1.7 SPECIFIED PRODUCT WARRANTY:

A. Provide shingle manufacturer's warranty on installed work, agreeing to pay for repair or replacement of defective shingles as necessary to eliminate leaks. Period of warranty is 20 years from date of substantial completion.

PART 2 - PRODUCTS

2..1 ASPHALT SHINGLE MATERIALS:

A. 3-Dimensional Heavy-duty Architectural Grade Laminated Strip Shingle, UL Class "A": Mineral-surfaced, self-sealing, laminated multi-ply overlay construction fiberglass based strip shingle complying with ASTM D 3018, Type 1, and with ASTM D 3462. Provide shingles bearing UL Class "A" external fire exposure label and UL "Wind Resistant" label. Color as selected by Architect. 250 lbs/Square minimum.

Products: Subject to compliance with requirements, provide one of the following:

a. GAF Corporation
b. Georgia-Pacific
c. Owens-Corning

B. Asphalt-Saturated Roofing Felt: No. 15, unperforated organic felt, complying with ASTM D 226 Type I, 36" wide, approximate weight 18 lbs./square.

C. Smooth Surface Roll Roofing: Smooth surface asphalt roll roofing, 36" wide, complying with ASTM D 224, Type I.

D. Asphalt Plastic Cement: Fibrated asphalt cement complying with ASTM D 2822, designed for trowel application.

E. Hip and Ridge Shingles: Manufacturer's standard factory pre-cut units to match shingles.

F. Nails: Aluminum or hot-dip galvanized 11 or 12-gage, sharp-pointed, conventional roofing nails with barbed shanks, minimum 3/8" diameter head, and of sufficient length to penetrate 3/4" into solid decking or to penetrate through plywood sheathing.

G. Staples: NOT ALLOWED

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine substrate and conditions under which shingling work is to be performed and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with shingling work until unsatisfactory conditions have been corrected.

3.2 PREPARATION OF SUBSTRATE:

A. Clean substrate of any projections and substances detrimental to shingling work. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with roofing nails.

B. Coordinate installation of shingles with flashing and other adjoining work to ensure proper sequencing. Do not install shingle roofing until all vent stacks and other penetrations through roofing have been installed and are securely fastened against movement.

3.3 INSTALLATION:

A. General: Comply with instructions and recommendations of shingle manufacturer, except to extent more stringent requirements are indicated.

B. Underlayment: Apply one layer felt horizontally over entire surface, lapping succeeding courses 2" minimum and fastening with sufficient nails to hold in place until shingle application.

C. Ice Protection Underlayment: See Section 07115 - Sheet Waterproofing.

D. Shingles: Install starter strip of roll roofing or inverted shingles with tabs removed; fasten shingles in pattern, weather exposure and number of fasteners per shingle as recommended by manufacturer. Use horizontal and vertical chalk lines to ensure straight coursing.

E. Comply with installation details and recommendations of shingle manufacturer and NRCA Steep Roofing Manual.

F. Flashing and Edge Protection: Install metal flashing, vent flashing and edge protection as indicated and in compliance with details and recommendations of the NRCA Steep Roofing Manual.

3.4 EXTRA STOCK:

A. Provide minimum of 2% of installed quantity of each type/color/ texture shingle used in the work. Provide in unopened clearly labeled bundles or containers.

END OF SECTION 07311

SECTION 07321 - ROOF TILES (Cedar City Liquor Store)

PART 1 GENERAL

1.1 SECTION INCLUDES

Concrete tile roofing.

Vented roof deck construction for tile roofing.

1.2 RELATED SECTIONS

Section 06100 - Rough Carpentry.

Section 07200 - Insulation.

Section 07600 - Flashing and Sheet Metal.

Section 07700 - Roof Specialties and Accessories.

1.3 REFERENCES

ASTM A641: Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

ASTM D226: Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

ASTM D4869: Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data for each material and product used. Preparation instructions and recommendations. Storage and handling requirements and recommendations. Installation methods.

B. Selection Samples: For each finish product specified, submit samples indicating manufacturer's full range of available colors and patterns.

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

D. Warranty: Submit manufacturer’s standard warranty.

E. Closeout Submittals:
Product Documentation.
Installation Guide.
Warning Labels.

F. Comply with pertinent provisions of Section 01300.

G. In accordance with the approved submittal schedule, submit a material list of items proposed to be provided under this Section, proving compliance with the specified requirements.

1.5 QUALITY ASSURANCE

Manufacturer Qualifications: At least a 15-year history of manufacturing products which meet the requirements of this section.

Installer Qualifications: At least a 10-year history of installing products which meet the requirements of this section. Installer shall provide the names and contact information for at least five (5) prior customers or clients.

Installation: Refer to the Tile Roofing Institute Installation Manual for Cold and Snow Regions.

Product Requirements:
Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years.

Mock-Up:
Provide mock-up as required to demonstrate quality of workmanship.
Finish areas designated by Architect.
Do not proceed with remaining work until material and workmanship are approved by Architect.
Modify mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver, handle, and store materials in accordance with manufacturer's instructions. Refer to roof loading guide of the Tile Roofing Institute Installation Manual for Cold and Snow Regions.

Store products in manufacturer's unopened packaging until ready for installation.

Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

Anticipate environmental conditions (temperature, humidity, and ventilation) to schedule work within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

Manufacturer shall warrant the products against manufacturing defects and shall include material and labor to repair or replace defective materials as specified in manufacturer’s

warranty. Warranty Period - Concrete Roof Tile: Lifetime transferable limited product warranty for concrete roof tile.

PART 2 PRODUCTS

2.1 MANUFACTURERS

Acceptable Manufacturers:

Eagle Roofing Products - Rialto 2352 N. Locust Ave., Rialto, CA 92377. Tel: (800) 300-3245. Fax: (909) 854-7181. Web: http://www.eagleroofing.com.

Bartile – 725 North 1000 West, Centerville, UT 84014. Tel. (800) 933-5038 or (801) 295-3443. Web: http://www.bartile.com.

Substitutions: Permitted. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 TILE

Concrete Roof Tile: As manufactured by manufacturer listed above.

B. Eagle Roofing Products - Capistrano Tile:
   a. Weight: Standard weight.
   b. Shape: High profile.
   c. Tile Color and Finish: as selected by architect.
   d. Trim Tile: Round type.
   e. Trim Tile Color: as selected by architect.
   f. Hip Starters: Round.
   g. Hip Starters Color: as selected by architect.

C. Bartile – Sierra Mission
   a. Weight: Super Duty.
   b. Shape: High profile.
   c. Tile Color and Finish: as selected by architect.
   d. Trim Tile: Round type.
   e. Trim Tile Color: as selected by architect.
   f. Hip Starters: Round.
   g. Hip Starters Color: as selected by architect.

2.3 RELATED MATERIALS

A. Eave Ventilation, eave risers/birdstop and ridge ventilation materials as recommended by manufacturer.

B. Decking:
Sheathing shall be structured to support the loads required, but not less than nominal 1 inch (25 mm) thick lumber or nominal 15/32 inch (12 mm) thick plywood or other decking material recognized in a code evaluation report or by the local building official.

C. Underlayment:
Nominal: One layer of No. 30 asphalt-saturated felt complying with ASTM D-226 Type 11 or ASTM D4869 Type IV, unless noted otherwise.
Upgraded Underlayment: Versashield by GAF Corp.
Weather Barrier: Composite 60 mil HDPE and rubberized asphalt self adhering weather barrier sheet.
Comply with the Tile Roofing Institute Moderate Climate Installation Guide's Table 1A and Table 1B for specific requirements according to roof pitch.

D. Battens:
Nominal 1 inch by 2 inches (25 mm by 51 mm) complying with IBC Chapter 23, section 2302.

E. Eave Closure/Riser/Bird Stop: Comply with MC 10, MC-10A, 10B, 10C & or 10D (Tile Roofing Institute Moderate Climate Installation Guide ICC-ES ESR 2015P).

F. Rake and Ridge Flashing: Flashing shall be a minimum No. 26 gage Galvanized steel G90 or equal, color as selected by architect.

G. Valley Flashings:
No. 26 Gauge (G90) Galvanized 24 inches (610 mm) Flashing.
Comply with Tile Roofing Institute Moderate Climate Installation Guide MC 12B.

H. Wall Trays (Pans) Flashing:
No. 26 Gauge (G90) Galvanized minimum 6 inches (152 mm) trough.
Comply with Tile Roofing Institute Moderate Climate Installation Guide MC 12B.

I. Roof to Wall Flashing: No. 26 Gauge (G90) Galvanized or flexible flashing to provide minimum 3 inches (76 mm) coverage.

J. Pipe Flashing:
No. 26 Gauge (G90) Galvanized deck flashing installed with underlayment.
Flat tile flashing - No. 26 Gauge (G90) Galvanized.
High/Medium profile tile flashing – 2-1/2 lb. lead, dead soft aluminum or copper.

K. In Wall Counter Flashing: No. 26 Gauge (G90) Galvanized Z-Bar flashing recommended or surface mount reglet (pin) flashing for reroofing applications.

L. Tile Fasteners:
Corrosive resistant fastener meeting ASTM A641 Class I or approved equal. Number 11 gauge diameter and of sufficient length to penetrate 3/4 inch (19 mm) into or through the thickness of the deck or the batten. Comply with Tile Roofing Institute Moderate Climate Installation Guide Table 1A and 1B.

M. Adhesive/Sealant: Tile adhesive formulated for use with concrete roof tile.

N. Ventilation: Per local building code requirement.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to Tile Roofing Institute Moderate Climate Installation Guide ICC-ES ESR 2015P (TRI Guide).

B. Install in accordance with manufacturer's installation specifications and guides and in accordance with A. (above) and applicable codes.

3.2 EXAMINATION

Examine areas to receive tile to verify conditions. Do not commence tile installation until unsatisfactory conditions are corrected.

3.3 INSTALLATION

Roof Layout: Layout according to TRI Guide MC 07, MC 08, MC 08A, MC 09.

Battens: Install according to TRI Guide Table 1, Table 2, Table 3, MC 04 or MC-05, MC 06, MC 06A.

Underlayment: Install according to TRI Guide MC 01A, MC 01B and manufacturer's instructions.

Vent Pipes: Install according to TRI Guide MC 02.

Eave/Gable: Install according to MC 10, MC 10A, MC 10B, MC 20, MC 20A.

Venting: Install according to TRI Guide MC 21, manufacturer's instructions and local code requirements.

Hip and Ridge: Install according to TRI Guide MC 18, MC 18A, MC 18B.

Rake: Install according to TRI Guide MC 19, MC 19A, MC 19B.

Valleys: Install according to TRI Guide MC 03, MC 03A, MC 17, MC 17A, MC 17B, MC 17C, MC 17D.

Side Wall Flashing: Install according to TRI Guide MC 12, MC 12A, MC 13, MC 13A.

Head and Apron Flashing: Install according to TRI Guide MC 11, MC 11A.

Chimneys: Install according to TRI Guide MC 14, MC 14A, MC 15, MC 15A.

Skylights: Install according to TRI Guide MC 16, MC 16A, MC 16B.

Gutters: Install according to TRI Guide MC 23.

3.4 SPECIAL APPLICATIONS:

Slope changes – Refer to TRI Guide MC 22.

Spaced Sheathing – Refer to TRI Guide Appendix B.

Adhesive Fastening – Refer to TRI Guide Appendix B.

Design for High Wind – Refer to TRI Guide Appendix B.

3.5 CLEAN-UP:

Remove all debris including any cut dust from roof daily.

3.6 PROTECTION:

Protect material and take precautions to prevent other trades from damaging roof during and after installation.

3.7 EXTRA STOCK:

A. Provide extra stock equal to at least 10% of the number of each type of roof tiles installed on the job. Extra stock shall be in manufacturer's **unopened** original packaging or shipping containers.

END OF SECTION 07321

SECTION 07322 - SLATE ROOFING SHINGLES (PLEASANT GROVE ONLY - ALTERNATE BID)

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.

B. Also see Section 07115 - Sheet Waterproofing

1..2 DESCRIPTION OF WORK:

A. Extent of shingles is indicated on drawings and is hereby defined to include units employed as weather protection for sloped roofs.

1..3 QUALITY ASSURANCE:

A. UL Listing: Provide labeled materials which have been tested and listed by UL for Class and Rating indicated for each shingle type required.

B. Roofing shall be applied by workmen experienced in the applying of slate.

1..4 SUBMITTALS:

A. Product Data: Submit technical product data, installation instructions and recommendations from shingle manufacturer, including data that materials comply with requirements.

B. Samples: Submit full range of samples for color and texture selection. After selection, submit 2 full-size shingles for verification of each color/style/texture selected.

1..5 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials in manufacturer's unopened, labeled bundles, rolls or containers.

B. Store materials to avoid water damage, and store rolled goods on end. Comply with manufacturer's recommendations for job-site storage and protection.

1..6 JOB CONDITIONS:

A. Substrate: Proceed with shingle work only after substrate construction and penetrating work have been completed.

B. Weather Conditions: Proceed with shingle work only when weather conditions are in compliance

with manufacturer's recommendations and when substrate is completely dry.

1..7 SPECIFIED PRODUCT WARRANTY:

A. Provide shingle manufacturer's warranty on installed work, agreeing to pay for repair or replacement of defective shingles as necessary to eliminate leaks. Period of warranty is 25 years from date of substantial completion.

B. A written guarantee shall be furnished by the contractor, that materials are in accordance with these specifications and that all repairs required on the roof due to defective material or workmanship furnished under this contract shall be made, without cost to the owner, for a period of twenty five years.

PART 2 - PRODUCTS

2..1 SLATE SHINGLE MATERIALS:

A. Slate

1. Slate shall be of 16" lengths in standard widths with standard thickness for smooth texture. Grade A (ASTM S-1)
2. Slate shall be one length and random standard widths.
3. Slate color shall be predominantly grey. (English Grey or approved equal)
4. A certificate shall be furnished the roofing contractor by the quarrier certifying that the roofing slate furnished are in accordance with these specifications and/or approved layout.

B. See asphalt shingles Section. 07310.

C. Nails:
1. All slate shall be fastened with at least two large-head slater's solid copper nails. Use 3d (1 1/4") nails for slates 18" or less in length, 4d (1 1/2") for 20" or longer, and 6d (2") for slates on hips and ridges. (Thicker slates require longer and heavier gauge nails. The proper size may be determined by adding 1 inch to twice the thickness of the slate.) All nails should be of sufficient length to adequately penetrate the roof boarding.

PART 3 - EXECUTION

3..1 INSPECTION:

A. Examine substrate and conditions under which shingling work is to be performed and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with shingling work until unsatisfactory conditions have been corrected.

3..2 PREPARATION OF SUBSTRATE:

A. Clean substrate of any projections and substances detrimental to shingling work. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with roofing nails.

B. Coordinate installation of shingles with flashing and other adjoining work to ensure proper sequencing. Do not install shingle roofing until all vent stacks and other penetrations through roofing have been installed and are securely fastened against movement.

3..3 INSTALLATION:

A. Slating

1. The entire surface of all roofs, unless otherwise specified, and all other surfaces so indicated on the drawings, shall be covered with slate as herein specified, in a proper and watertight manner.

2. The slate shall project 2" at the eaves and from 1/2" to 1" as directed at all gable ends, and shall be laid in horizontal courses with 2" to 4" headlap depending on roof pitch and geographic location, and each course shall break joints with the preceding one by at least 3". Slates at the eaves or cornice line shall be doubled using same thickness slate for under-eaves at first exposed course. Under eave slate to be approximately 3" longer than exposure of first course.

3. Wood can't strip at eaves to be furnished by others.

4. Slates overlapping sheet metal work shall have the nails plaed as to avoid puncturing the sheet metal. Exposed nails shall be permissible only in top courses where unavoidable.

5. Neatly fit slate around all pipes, ventilators and other vertical surfaces.

6. Nails shall not be driven so far as to produce strain on the slate, nor left proud to stress overlapping slate.

7. Cover all exposed nail heads with elastic cement. Hip slates and ridge slates shall be laid in elastic cement spread thickly over unexposed surface of under courses of slate, nailed securely in place and carefully pointed with elastic cement.

8. Build in and place all flashing pieces, snow-guards, etc., furnished by the sheet metal contractor and cooperate with him in doing the work of flashing.

9. Upon completion, all slate must be sound, whole, clean, and the roof shall be left watertight and neat in every respect, and subject to the architect's approval.

B. Roofing Felt

1. On all boarding to be covered with slate, furnish and lay asphalt saturated rag felt, not less in weight than that commercially known as "30-lb." felt. In this weight, per 100 sq.ft., a tolerance of 1 lb. plus or minus will be allowed.
2. Felt shall be laid in horizontal layers with joints lapped toward eaves and at ends at least 2 in. and well secured along laps and at ends as necessary to properly hold the felt in place and protect the structure until covered by the slate. All felt shall be preserved unbroken, tight and whole.
3. The felt shall lap over all hips and ridges.
4. felt shall be lapped 2" over the metal of any valleys or built-in gutters.

C. Hips

1. All hips shall be laid to form "Boston" or "Miltered" Hips with copper step flashing.

D. Ridges

1. All ridges shall be laid to form "saddle" ridges. The nails of the combing slate shall pass through the joints of the slates below.

E. Valleys

1. All valleys shall be laid to form "open" valleys.

F. Elastic Cement

1. Cement shall be an approved brand of top quality waterproof elastic slaters cement colored to match as nearly as possible the general color of the slate, if available.

G. Nails

1. All slate shall be fastened with two large-head 10 gauge solid copper slating nails. Use 1 1/2" length for standard 3/16" to 1/4" thickness field slate and 2" nails for hip and ridge slate.

H. Ice Protection Underlayment: See Section 07115 - Sheet Waterproofing.

3..4 EXTRA STOCK:

A. Provide minimum of 2% of installed quantity of each type/color/ texture shingle used in the work. Provide in unopened clearly labeled bundles or containers.

END OF SECTION 07322

SECTION 07410 - PREFORMED ROOFING AND SIDING

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 DESCRIPTION OF WORK:

A. Extent of each type of preformed roofing and siding is indicated on the drawings and by provisions of this section.

B. Types of panels required include the following:
   1. Formed sheet panels, intended for standing snap-seam roof installation
   2. Formed sheet panels, intended for soffit panel installations (includes vented panels)

C. Substrate consisting of:
   1. Sheet waterproofing and roofing felts over plywood sheathing at standing snap-seam roof.

D. In some areas flashing must be applied underneath finished materials (such as siding, veneer, or stucco/EIFS). In these cases, and for other special cases, the Roofing Contractor **MUST** install the affected flashing prior to the installation of the finish material. This may necessitate the Roofing Contractor to mobilize on the project more than once – which will be required, and no additional compensation will be given to the Contractor for this purpose after the bid is awarded.

E. Snow Guards: provide snow guards on all standing seam metal roofs in areas shown on drawings. Color of snow guards shall match as closely as possible the color of the metal roofing panels.

1..3 QUALITY ASSURANCE:

A. Performance Test Standards: Provide preformed panel systems which have been pre-tested and certified by manufacturer to provide specified resistance to air and water infiltration and structural deflection and failure when installed as indicated. Roof system must be certified to pass UL 90 test.

1..4 GUARANTEE:

A. In addition to the Guarantee required by the General Conditions, the installer/supplier shall provide a 5-year material and labor guarantee against leaks or other failures in the preformed roofing and siding system.

1..5 SUBMITTALS:

A. Product Data: Submit manufacturer's product specifications, standard details, certified product test results, installation instructions and general recommendations, as applicable to materials and finishes for each component and for total system of preformed panels.

B. Samples: Submit 2 samples 12" square, of each exposed finish material.

C. Shop Drawings: Submit small-scale layouts of panels on walls and roofs, and large-scale details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory and field assembly work.

PART 2 - PRODUCTS

2..1 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering preformed roofing and siding products, which may be incorporated in the work, include, but are not limited to, the following:

1. Steel Roofing and Siding:

a. AEP-Span/Div. Overhead Door Corp.
b. Alumaz Building Specialties Division
c. Vincent Metals
d. ASC Pacific
e. MBCI Steelco

2..2 SHEET MATERIALS:

A. Steel for Painting/Coating: Minimum 24 gauge hot-dip zinc coated steel sheet, ASTM A 446, Grade C except where higher strength required for performance, G90 zinc coating, surface treated for maximum coating performance.

B. Gutters and Downspouts: Minimum 22 gauge hot-dip zinc coated steel sheet, ASTM A 446, Grade C except where higher strength required for performance, G90 zinc coating, surface treated for maximum coating performance.

2..3 METAL FINISHES:

A. General: Apply coatings either before or after forming and fabricating panels, as required by coating process and as required for maximum coating performance capability. Protect coating promptly after application and cure, by application of strippable film or removable adhesive cover, and retain until installation has been completed. Provide color to match the existing preformed metal roof system on site.

B. Flouropolymer Coating: Full-strength 70% "Kynar 500" coating baked-on for 15 minutes at 450 deg. F (232 deg. C), in a dry film thickness of 1.0 mils, 30% reflective gloss (ASTM D 523), over min. 0.2 mil baked-on modified epoxy primer.

1. Durability: Provide coating which has been field tested under normal range of weathering conditions for minimum of 20 years without significant peel, blister, flake, chip, crack or check in finish, and without chalking in excess of 8 (ASTM D 659), and without fading in excess of 5 NBS units.
2. Color: Premium Range Color

2..4 MISCELLANEOUS MATERIALS:

A. Fasteners: Manufacturer's standard non-corrosive types, with exterior heads gasketed. Provide "Hex-Head" screws at wall panels.

B. Accessories: Except as indicated as work of another specification section, provide components required for a complete roofing/siding system, including trim, copings, fascias, mullions, sills, corner units, ridge closures, clips, seam covers, battens, flashings, sealants, gaskets, fillers, closure strips, rain gutters, down spouts, snow grabbers and similar items. Match materials/finishes of preformed panels.

C. Bituminous Coating: Cold-applied asphalt mastic, SSPC paint 12, compounded for 15-mil dry film thickness per coat.

D. Snow guards: provide and install Berger Bros. Co., (800) 523-8852, “Real Tool RT 300” Snow Guards or equal as approved by the Architect, with color by manufacturer matching as closely as possible the color of the metal roofing panels.

2..5 PANEL FABRICATION; PERFORMANCES:

A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, and as required to fulfill indicated performance requirements which have been demonstrated by factory testing. Comply with indicated profiles and dimensional requirements, and with structural requirements.

1. Metal Gages: Thicknesses required for structural performances, but not less than manufacturer's recommended minimums for profiles and applications indicated, and not less than 24 gage for exterior panels.
2. Standing Snap-Seam Metal Roof: Panels shall be a uniformly dimensioned system in which the standing seams are rolled as an integral part of the panel. Panels shall be minimum 12" and maximum 16 1/2” wide with 1 1/2" minimum and 2 1/2" maximum high true standing seam on one side and a lock and raised leg on the other. The raised leg shall act as a secondary water diverter. The panels shall be anchored by concealed clips to the lock at 24" o.c. minimum. Optional shop installed sealant shall be provided if recommended by manufacturer for this application.
3. Metal Soffit Panel: Panels shall be a uniformly dimensioned system in which the interlocking flanges are rolled as an integral part of the system. Panels shall be Alcoa Alumi-Guard Plus 12" wide and 3/8" thick non-vented and center vented. The panels shall be anchored with concealed fasteners at 24" o.c. Provide vented panels as noted on the plans, along the exterior soffits.

B. Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with substrate materials which are non-compatible or could result in corrosion or deterioration of either material or finishes.

C. Fabricate panel joints with captive gaskets or separator strips, which provide a tight seal and prevent metal-to-metal contact in a manner, which will minimize noise from movements within panel system.

D. Condensation: Fabricate panels for control of condensation, including vapor inclusion of seals and provisions for breathing, venting, weeping and draining.

2..6 SUBSTRATE MATERIALS:

A. As listed in other specification sections, or shown on drawings.

PART 3 - EXECUTION

3..1 INSTALLATION:

A. General: Comply with panel fabricator's and material manufacturers' instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the work securely in place, with provisions for thermal/structural movement.

1. Install standing snap-seam roof and soffit panels with concealed fasteners.

B. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4" in 20'-0" on level/plumb/slope and location/line as indicated, and within 1/8" offset of adjoining faces and of alignment of matching profiles.

C. Joint Sealers: Install gaskets, joint fillers and sealants where indicated and where required for weatherproof performance of panel systems. Provide types of gaskets and sealants/fillers indicated or, if not otherwise indicated, types recommended by manufacturer.

D. Joint Sealers: Refer to other sections of these specifications for post-installation requirements on joint sealers; not work of this section.

E. Construct integral gutter as shown on plans.

F. Install snow guards in accordance with manufacturer’s specifications and recommendations.

3..2 CLEANING AND PROTECTION:

A. Damaged Units: Replace panels and other components of the work, which have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures.

B. Cleaning: Remove temporary protective coverings and strippable films (if any) as each panel is installed. Upon completion of panel installation, clean finished surfaces as recommended by panel manufacturer, and maintain in a clean condition during construction.

END OF SECTION 07410

SECTION 07511 – THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING

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.

1. Thermoplastic Polyolefin (TPO) membrane roofing system. Provide **60 mil membrane**,light gray or white in color, meeting the following physical properties and requirements:

   a. Breaking Strength: 225 lbf (1kN); ASTM D 751, grab method.
   b. Elongation at Break: 25 percent, ASTM D 751.
   c. Tearing strength: 55 lbf minimum; ASTM D 751, Procedure B.
   d. Brittleness Point: Minus -40 deg. F.
   e. Ozone Resistance: No cracks after sample, wrapped around a 3-inch (75 mm.) diameter mandrel, is exposed for 166 hours to a temperature of 104 deg F (40 deg C) and an ozone level of 100 pphm (100 mPa); ASTM D 1149.
   f. Resistance to Heat Aging: 90 percent minimum retention of breaking strength, elongation at break, and tearing strength after 166 hours at 240 deg F (116 deg C); ASTM D 573.
   g. Water Absorption: Less than 4 percent max. mass change after 166 hours immersion at 158 deg F (70 deg C); ASTM D 471.
   h. Linear Dimension Change: Plus or minus 1 percent; ASTM D 1204.
   i. Provide auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
   j. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, **60 mils thick**, minimum, of same color as sheet membrane.
   k. Bonding Adhesive: Manufacturer's standard solvent-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.
   l. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions of FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
   m. Miscellaneous Accessories: Provide pourable sealer, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint cover, termination reglets, cover strips, and other accessories.
   j. Install all roofing materials in accordance with manufacturer's recommendations and current applicable codes.
   i. Available Manufacturers:

      1. Carlisle Syn Tec Incorporated.
      2. Firestone Building Products Company.
      3. GAF Materials Corporation.
      4. GenFlex Roofing Systems.
      5. Johns Manville International, Inc.
      6. Sarnafil Inc.
      7. Stevens Roofing Systems; Division of JPS Elastomerics.

C. Related work specified elsewhere is as follows:

1. Metal counterflashings, copings and expansion joint covers are specified in another Division 7 Section.

2. Division 6 Section “Rough Carpentry” for Wood Nailers and Curbs.

D. Quality Assurance:

1. Manufacturer Qualifications: Provide primary products, including each type of roofing sheet composition flashings, produced or labeled by primary system manufacturer. Provide secondary products only as approved in writing by manufacturer of primary products for use with roofing system specified.

2. Installer qualifications: A single Installer (“Roofer”) shall perform the work of this Section.
   a. Contractor shall be pre-qualified prior to acceptance of bid according to the procedures outlined in the ROOFING CONTRACTOR QUALIFICATION STATEMENT included in these documents.

3. Installer’s Field Supervision: Installer must maintain full-time supervisor/foreman on job site during times that roofing work is in progress.
   a. Maintain same foreman/supervisor on the job throughout the Construction Period.
   b. Any changes because of extenuating circumstances must by approved by the Architect.
   c. Field Supervisor’s Qualifications:
      1) Minimum of 5 years experience in roofing work similar in nature and scope to specified work.
      2) Ability to fluently speak and read English, understand roofing terminology applicable to specified work and able to read and understand Construction Documents.

4. Pre-Installation Roofing Conference: Approximately two weeks prior to scheduled commencement of built-up (or alternate) roofing installation and associated work, meet at project site with Roofing Installer, Roofer's Field Supervisor, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, in and around roofing which must precede or follow roofing work, Architect, Owners Representative, Agency Representative and other representatives directly concerned with performance of the work.
   a. Review foreseeable methods and procedures related to roofing work, including but not necessarily limited to the following:
      1) Tour representative areas of roof inspect and discuss condition of substrate, roof drains, curbs, penetrations and other existing work which must be considered in conjunction with roof installation.
      2) Review roofing system requirements (drawings, specifications and other contract documents).
      3) Review required submittals, both completed and yet to be completed.
      4) Review and finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
      5) Review required inspection, testing, certifying and material usage accounting procedures.
      6) Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.

   b. Architect will record discussions of conference and decisions and agreements (or disagreements) reached and furnish copy of record to each party attending.

c. Field Supervisor's Qualifications:
   1) Minimum of 5 years experience in roofing work similar in nature and scope to specified work.

5. Governing standards: Provide TPO roofing system and component materials which have been tested for application and slopes indicated and comply with applicable standards of the following organizations:
   a. Underwriters Laboratories, Inc. (UL) for Class A external fire exposure.
      1) Provide roof covering materials bearing Classification Marking (UL) on bundle, package or container indicating that materials have been produced under UL's Classification and Follow-Up Service.
   b. Factory Mutual, minimum Wind Uplift Classification of I-90.
   c. International Building Code, latest edition.
   d. National Roofing Contractors Association (NRCA)
   e. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
   f. American Society for testing and Materials (ASTM)
   g. American Roofing Manufacturers Association (ARMA)
   h. RIC-TIMA

6. Conflicts of Governing Standards: If conflicts occur between any listed governing standards or between listed standards and Construction Documents, comply with the most expensive, stringent, limiting or explicit requirements as judged by the Architect.
   a. Refer any conflicts to Architect for direction before proceeding.

7. Quality of Installation: Requirements for Quality of Work are intended for procurement of manufacturer's highest grade product for type of roofing system indicated. All work shall meet or exceed manufacturer's latest published requirements which would qualify for a 20 year labor and material "No Dollar Limit" guarantee.
   a. Owner will not purchase Manufacturer's Roof Membrane Warranty.

8. Inspection and Testing of Installation:
   a. Owner's Inspectors: Owner's Inspectors may observe the work periodically for compliance with requirements.
      1) Inspectors will report observations to Architect, Owner and Contractor.
      2) Architect will give directions for any corrective work based on observations by Owners Inspectors.
   b. Inspection Services: Owner's may employ services of an independent inspection agency to observe (full or part time) installation of the work.

1.3 SUBMITTALS

A. Product Data, including manufacturer's technical product data, installation instructions, and recommendations for each type of roofing product required. Include data substantiating that materials comply with requirements.

   1. For TPO, provide label on each container or certification with each load of roofing materials.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer ("Roofer") to perform TPO roofing work who has specialized in the installation of TPO roofing systems similar to that required for this project and who is acceptable to by manufacturer of primary roofing materials.

   1. Installer Certification: Obtain written certification from manufacturer of TPO roofing system

certifying that Installer is approved by manufacturer for installation of specified roofing system. Provide copy of certification to Architect prior to award of roofing work.

B. Manufacturer Qualifications: Obtain primary products from a single manufacturer. Provide secondary products as recommended by manufacturer of primary products for use with roofing system specified.

C. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

D. UL Listing: Provide TPO roofing system and component materials that have been tested for application and slopes indicated and are listed by Underwriters Laboratories, Inc. (UL) for Class A external fire exposure.

1. Provide roof-covering materials bearing UL Classification Marking on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-up Service.

2. Provide built-up roofing system that can be installed to comply with UL requirements for "Fire Classified" and "Class 90" wind uplift requirements.

E. FM Listing: Provide TPO roofing system and component materials that have been evaluated by Factory Mutual System for fire spread, wind uplift, and hail damage and are listed in "Factory Mutual Approval Guide" for Class I construction.

1. Provide roof covering materials bearing FM approval marking on bundle, package, or container, indicating that material has been subjected to FM's examination and follow-up inspection service.

F. Fire Performance Characteristics: Provide insulation materials that are identical to materials whose fire performance characteristics, per requirements listed in Part 2 of this Section, have been determined by testing by UL or other testing and inspecting agency acceptable to authorities having jurisdiction, when tested for the assemblies of which the insulation materials are a part and in accordance with test methods.

G. Preliminary Roofing Conference: As soon as possible after award of TPO roofing work, meet with Installer (Roofer), installers of substrate construction (decks) and other work adjoining roof system including penetrating work and rooftop units, Architect, Owner, and representatives of other entities directly concerned with performance of roofing system including (as applicable) Owner's insurers and test agencies.

1. Review requirements (Contract Documents), submittals, status of coordinating work, availability of materials, and installation facilities and establish preliminary installation schedule. Review requirements for inspections, testing, certifications, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures.

2. Discuss roofing system protection requirements for construction period extending beyond roofing installation. Discuss possible need for temporary roofing.

3. Record discussion, including agreement or disagreement on matters of significance; furnish copy of recorded discussions to each participant. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

H. Pre-application Roofing Conference: Approximately two weeks prior to scheduled commencement of TPO roofing installation and associated work, meet at project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in and around roofing that must precede or follow roofing work (including mechanical work if any), Architect, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the work, including (where applicable) Owner's insurers, test agencies, and governing authorities.

1. Review foreseeable methods and procedures related to roofing work, including but not necessarily limited to the following:

a. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations, and other preparatory work performed by other trades.
b. Review structural loading limitations of steel deck and inspect deck for loss of flatness and for required mechanical fastening.
c. Review roofing system requirements (drawings, specifications, and other contract documents).
d. Review required submittals, both completed and yet to be completed.
e. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
f. Review required inspection, testing, certifying, and material usage accounting procedures.
g. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not a mandatory requirement).

1.5 PROJECT CONDITIONS

A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store and handle all roofing materials and accessories in a manner that will ensure that there is no possibility of significant moisture pickup. Store in a dry, well-ventilated, weather-tight place. Unless protected from weather or other moisture sources, do not leave unused felts on the roof overnight or when roofing work is not in progress. Store rolls of felt and other sheet materials on end on pallets or other raised surface. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.

1.7 WARRANTIES

A. Manufacturer's Warranty: Submit executed copy of roofing manufacturer's standard "Limited Service Warranty" agreement including flashing endorsement, signed by an authorized representative of TPO roofing system manufacturer, on form that was published with product literature as of date of Contract Documents, for the following period of time:

1. 20 years after date of Substantial Completion.

PART 2 - PRODUCT

1.8 ROOF INSULATION

A. Polyisocyanurate Foam Board Insulation: Rigid boards of minimum 2.0 lb./cu. ft. density polyisocyanurate based foam core, permanently bonded to roofing felt facer sheets. Provide in thickness indicated, with minimum aged K-value of 0.17 (when conditioned per RIC/TIMA Bulletin NO. 281-1).

1.9 THERMOPLASTIC PLYOLEFIN (TPO) membrane roofing system. Provide **60-mil membrane**, light gray or white in color, meeting the following physical properties and requirements:

a. Breaking Strength: 225 lbf (1kN); ASTM D 751, grab method.
b. Elongation at Break: 25 percent, ASTM D 751.
c. Tearing strength: 55 lbf minimum; ASTM D 751, Procedure B.
d. Brittleness Point: Minus -40 deg. F.
e. Ozone Resistance: No cracks after sample, wrapped around a 3-inch (75 mm.) diameter mandrel, is exposed for 166 hours to a temperature of 104 deg F (40 deg C) and an ozone level of 100 pphm (100 mPa); ASTM D 1149.
f. Resistance to Heat Aging: 90 percent minimum retention of breaking strength, elongation at break, and tearing strength after 166 hours at 240 deg F (116 deg C); ASTM D 573.
g. Water Absorption: Less than 4 percent max. mass change after 166 hours immersion at 158 deg F (70 deg C); ASTM D 471.
h. Linear Dimension Change: Plus or minus 1 percent; ASTM D 1204.
i. Provide auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
j. Sheet Flashing: Manufacturer’s standard unreinforced thermoplastic polyolefin sheet flashing, **60 mils thick**, minimum, of same color as sheet membrane.
k. Bonding Adhesive: Manufacturer’s standard solvent-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.
l. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions of FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
m. Miscellaneous Accessories: Provide pourable sealer, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint cover, termination reglets, cover strips, and other accessories.
j. Install all roofing materials in accordance with manufacturer’s recommendations and current applicable codes.
i. Available Manufacturers:

1. Carlisle Syn Tec Incorporated.
2. Firestone Building Products Company.
3. GAF Materials Corporation.
4. GenFlex Roofing Systems.
5. Johns Manville International, Inc.
6. Sarnafil Inc.
7. Stevens Roofing Systems; Division of JPS Elastomerics.

1.10 SHEET METAL ACCESSORY MATERIALS

A. Refer to Section 07600, "FLASHING AND SHEET METAL."

1.11 MISCELLANEOUS MATERIALS

A. Wood Members, Units: Comply with requirements of "Carpentry" sections of these specifications for nailers, walkway units, and other wood members indicated as roofing system work. Provide wood pressure treated with waterborne preservatives for above-ground use (AWPB LP-2).

B. Substrate Joint Tape: 6-inch or 8-inch-wide coated glass-fiber joint tape.

C. Mastic Sealant: Polysiobutylene (plain or bituminous modified), nonhardening, nonmigrating, nonskinning, and nondrying.

D. Fasteners: Provide industry-standard types of mechanical fasteners for TPO roofing system work, tested by manufacturer for required pull-out strength where applicable and compatible with deck type and roofing products used. Provide either 1-inch-diameter nail heads or 1-3/8-inch-diameter by 30-gage sheet metal caps for nails used to secure base sheets, felts, or insulation boards of roofing system.

1.12 FABRICATION OF SHEET METAL ACCESSORIES

A. SMACNA and NRCA Details: Conform work with details shown and with applicable fabrication requirements of "Architectural Sheet Metal Manual" by SMACNA. Comply with installation details of "Roofing and Waterproofing Manual" by NRCA.

B. Fabricate work with flat-lock soldered joints and seams; except where joint movement is necessary, provide 1-inch-deep interlocking hooked flanges filled with mastic sealant.

C. Fabricate roof insulation vents with 4-inch-diameter stack, 12 inches high, filled with glass-fiber insulation. Equip stack with 6-inch-diameter by 3-inch-high weatherproof vent cap.

D. Fabricate penetration sleeves with minimum 8-inch-high stack, of diameter 1 inch larger than penetrating element. Counterflashing is specified as work of another section of these specifications.

PART 3 - EXECUTION

1.1 INSPECTION OF SUBSTRATE

A. Examine substrate surfaces to receive TPO roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

1. Verify that flatness and fastening of metal roof decks comply with the following:

a. Top Flanges: No concavity or convexity in excess of 1/16 inch across any 3 adjacent flanges.
b. Side Laps: Properly nested and mechanically fastened at a maximum spacing of 3 feet o.c.
c. End Laps: Minimum 2-inch laps located over and fastened to supports.
d. Deck secured to each supporting member in every other rib (maximum spacing 12 inches o.c.) with puddle welds or approved mechanical fasteners.

1.2 GENERAL INSTALLATION REQUIREMENTS

A. Insurance/Code Compliance: Install TPO roofing system for (and test where required to show) compliance with governing regulations and with the following insurance requirements:

1. Factory Mutual requirements for "Class I" or "Noncombustible," including zoned wind resistance as specified by FM.

2. Underwriters Laboratories "Fire Classified" and "Class 90" wind uplift resistance.

B. Coordinate the installation of insulation, roofing sheets, flashings, stripping, coatings, and surfacings so that insulation is not exposed to precipitation or exposed overnight. Provide cut offs at end of each day's work, to cover exposed membrane and insulation with a course of membrane with joints and edges sealed with appropriate material. Remove cut offs immediately before resuming work. Glaze-coat installed ply-sheet courses at end of each day's work where final surfacing has not been installed.

C. Cutoffs: At end of each day's roofing installation, protect exposed edge of incomplete work. Provide temporary covering of membrane; remove at beginning of next day's work.

1.3 VAPOR RETARDER INSTALLATION

A. Vapor Retarder on Steel Decks: Mechanically fasten one course of perlite board roof insulation in thickness as required to span deck flutes, but not less than 1 inch thick. Use FM-approved fasteners specifically designed for securing insulation boards to steel roof deck and driven through metal discs. Space fasteners in accordance with FM requirements for Windstorm Resistance Classification I-90. Locate end joints of insulation over deck flutes.

1.4 INSTALLATION OF INSULATION

A. General: Comply with insulation manufacturer's instructions and recommendations for the handling, installation, and bonding or anchorage of insulation to substrate.

B. Set insulation in hot solid mopping of Type III asphalt, applied within temperature range of EVT plus or minus 25 deg F (14 deg C) and at rate of 25 pounds (plus or minus 15 percent on the job, all-job average basis) per 100 sq. ft. Run long joints of insulation in continuous straight line, perpendicular to roof slope, with end joints staggered between rows.

C. Secure insulation to deck using mechanical fasteners specifically designed and sized for attachment of specified board type insulation to deck type shown. Fasten insulation over entire area of roofing at spacing as required by FM for Windstorm Resistance Classification I-90. Run long joints for insulation in continuous straight lines, perpendicular to roof slope with end joints staggered between rows.

D. Two-Layer Installation: Where overall insulation thickness is 2 inches or greater, install required thickness in two layers with joints of second layer staggered from joints of first layer a minimum of 12 inches each direction. Install second layer in full mopping of hot Type III asphalt, applied within temperature range of EVT plus or minus 25 deg F (14 deg C) and at rate of 25 pounds (plus or minus 25 percent on total-job basis) per 100 sq. ft.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush with ring of drain.

1.5 ROOF MEMBRANE INSTALLATION

A. Shingling of Plies: Except as otherwise indicated, install membrane with ply sheets shingled uniformly to achieve required number of thickness of membrane throughout. Shingle in proper direction to shed water on each large area of roofing, where slope is significant (over 1/2 inch).

B. Cant Strips/Tapered Edge Strips: Except as otherwise shown, install preformed 45-deg insulation cant strips at junctures of TPO roofing system membrane with vertical surface. Provide preformed, tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

C. Base Sheet: Install one lapped course of base sheet. Mop to non- nailable substrate with steep asphalt, except use special adhesive where indicated.

D. Set-On Accessories: Where small roof accessories are set on built-up roofing membrane, set metal flanges in a bed of roofing cement and seal penetration of membrane with bead of roofing cement to prevent flow of bitumen from membrane.

1.6 FLASHING AND STRIPPING

A. Install stripping where metal flanges are set on roofing.

B. Roof Drains: Fill clamping ring base with a heavy coating of roofing cement. Set lead flashing sheet in a bed of roofing cement on completed TPO roofing ply sheet courses, with lead sheet clamped in roof drain ring and extended 12 inches onto roofing. Cover lead sheet with stripping, with plies extended 4 inches to 6 inches beyond edges of lead sheet.

C. Allow for expansion of running metal flashing and edge trim which adjoins roofing. Do not seal or bond membrane to metal flanges over 3 feet in length.

D. Counter-flashings: Counter-flashings, cap flashings, expansion joints, and similar work to be coordinated with TPO roofing work are specified in other sections of these specifications.

E. Roof Accessories: Miscellaneous sheet metal accessory items, including insulation vents and other devices, and major items of roof accessories (if any) to be coordinated with built-up roofing system work, are specified in other sections of these specifications.

END OF SECTION 07511

SECTION 07512 - BUILT-UP ASPHALT ROOFING

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. Extent of work includes the following:

1. Aggregate surfaced asphalt/glass-fiber felt roof membrane.
2. Roof insulation.
3. Modified bitumen flashing and stripping.
4. Roofing accessories integrally related to roof installation.

B. Related work specified elsewhere is as follows:

1. Metal counterflashings, copings and expansion joint covers are specified in another Division 7 Section.
2. Division 6 Section “Rough Carpentry” for Wood Nailers and Curbs.

C. Quality Assurance:

1. Manufacturer Qualifications: Provide primary products, including each type of roofing sheet (felt), bitumen, composition flashings, produced or labeled by primary system manufacturer. Provide secondary products only as approved in writing by manufacturer of primary products for use with roofing system specified.

2. Installer qualifications: A single Installer (“Roofer”) shall perform the work of this Section.
   a. Contractor shall be pre-qualified prior to acceptance of bid according to the procedures outlined in the ROOFING CONTRACTOR QUALIFICATION STATEMENT included in these documents.

3. Installer’s Field Supervision: Installer must maintain full-time supervisor/foreman on job site during times that roofing work is in progress.
   a. Maintain same foreman/supervisor on the job throughout the Construction Period.
   b. Any changes because of extenuating circumstances must by approved by the Architect.
   c. Field Supervisor’s Qualifications:
      1) Minimum of 5 years experience in roofing work similar in nature and scope to specified work.
      2) Ability to fluently speak and read English, understand roofing terminology applicable to specified work and able to read and understand Construction Documents.

4. Pre-Installation Roofing Conference: Approximately two weeks prior to scheduled commencement of built-up roofing installation and associated work, meet at project site with Roofing Installer, Roofer's Field Supervisor, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, in and around roofing which must precede or follow roofing work, Architect, Owners Representative,

Agency Representative and other representatives directly concerned with performance of the work.

a. Review foreseeable methods and procedures related to roofing work, including but not necessarily limited to the following:
   1) Tour representative areas of roof inspect and discuss condition of substrate, roof drains, curbs, penetrations and other existing work which must be considered in conjunction with roof installation.
   2) Review roofing system requirements (drawings, specifications and other contract documents).
   3) Review required submittals, both completed and yet to be completed.
   4) Review and finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
   5) Review required inspection, testing, certifying and material usage accounting procedures.
   6) Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.

b. Architect will record discussions of conference and decisions and agreements (or disagreements) reached and furnish copy of record to each party attending.

c. Field Supervisor’s Qualifications:
   1) Minimum of 5 years experience in roofing work similar in nature and scope to specified work.

5. Governing standards: Provide built-up roofing system and component materials which have been tested for application and slopes indicated and comply with applicable standards of the following organizations:
   a. Underwriters Laboratories, Inc. (UL) for Class A external fire exposure.
      1) Provide roof covering materials bearing Classification Marking (UL) on bundle, package or container indicating that materials have been produced under UL's Classification and Follow-Up Service.
   b. Factory Mutual, minimum Wind Uplift Classification of I-90.
   c. International Building Code, latest edition.
   d. National Roofing Contractors Association (NRCA)
   e. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
   f. American Society for testing and Materials (ASTM)
   g. American Roofing Manufacturers Association (ARMA)
   h. RIC-TIMA

6. Conflicts of Governing Standards: If conflicts occur between any listed governing standards or between listed standards and Construction Documents, comply with the most expensive, stringent, limiting or explicit requirements as judged by the Architect.
   a. Refer any conflicts to Architect for direction before proceeding.

7. Quality of Installation: Requirements for Quality of Work are intended for procurement of manufacturer's highest grade product for type of roofing system indicated. All work shall meet or exceed manufacturer's latest published requirements which would qualify for a 20 year labor and material "No Dollar Limit" guarantee.
   a. Owner will not purchase Manufacturer's Roof Membrane Warranty.

8. Inspection and Testing of Installation:
   a. Owner's Inspectors: Owner's Inspectors may observe the work periodically for compliance with requirements.
      1) Inspectors will report observations to Architect, Owner and Contractor.
      2) Architect will give directions for any corrective work based on observations by Owners Inspectors.

b. Inspection Services: Owner's may employ services of an independent inspection agency to observe (full or part time) installation of the work.

1.3 SUBMITTALS

A. Product Data, including manufacturer's technical product data, installation instructions, and recommendations for each type of roofing product required. Include data substantiating that materials comply with requirements.

1. For asphalt bitumen, provide label on each container or certification with each load of bulk bitumen, indicating flash point (FP), finished blowing temperature (FBT), softening point (SP), and equiviscous temperature (EVT).

B. Field Test Reports: Submit daily softening point test reports on samples of asphalt used on project, taken at beginning of each day's work and at 2-hour intervals during course of the work thereafter. Test by Ring and Ball Test, ASTM D 36, or similar recognized test method.

C. Samples of the following:

1. 3-pound samples of aggregate surfacing material.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer ("Roofer") to perform built-up asphalt roofing work who has specialized in the installation of built-up asphalt roofing systems similar to that required for this project and who is acceptable to by manufacturer of primary roofing materials.

1. Installer Certification: Obtain written certification from manufacturer of built-up roofing system certifying that Installer is approved by manufacturer for installation of specified roofing system. Provide copy of certification to Architect prior to award of roofing work.

B. Manufacturer Qualifications: Obtain primary products, including each type of roofing sheet (felt), bitumen, composition flashings, and vapor retarder (if any), from a single manufacturer. Provide secondary products as recommended by manufacturer of primary products for use with roofing system specified.

C. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

D. UL Listing: Provide built-up roofing system and component materials that have been tested for application and slopes indicated and are listed by Underwriters Laboratories, Inc. (UL) for Class A external fire exposure.

1. Provide roof-covering materials bearing UL Classification Marking on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-up Service.

2. Provide built-up roofing system that can be installed to comply with UL requirements for "Fire Classified" and "Class 90" wind uplift requirements.

E. FM Listing: Provide built-up roofing system and component materials that have been evaluated by Factory Mutual System for fire spread, wind uplift, and hail damage and are listed in "Factory

Mutual Approval Guide" for Class I construction.

1. Provide roof covering materials bearing FM approval marking on bundle, package, or container, indicating that material has been subjected to FM's examination and follow-up inspection service.

F. Fire Performance Characteristics: Provide insulation materials that are identical to materials whose fire performance characteristics, per requirements listed in Part 2 of this Section, have been determined by testing by UL or other testing and inspecting agency acceptable to authorities having jurisdiction, when tested for the assemblies of which the insulation materials are a part and in accordance with the following test methods:

G. Preliminary Roofing Conference: As soon as possible after award of built-up roofing work, meet with Installer (Roofer), installers of substrate construction (decks) and other work adjoining roof system including penetrating work and rooftop units, Architect, Owner, and representatives of other entities directly concerned with performance of roofing system including (as applicable) Owner's insurers and test agencies.

1. Review requirements (Contract Documents), submittals, status of coordinating work, availability of materials, and installation facilities and establish preliminary installation schedule. Review requirements for inspections, testing, certifications, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures.

2. Discuss roofing system protection requirements for construction period extending beyond roofing installation. Discuss possible need for temporary roofing.

3. Record discussion, including agreement or disagreement on matters of significance; furnish copy of recorded discussions to each participant. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

H. Pre-application Roofing Conference: Approximately two weeks prior to scheduled commencement of built-up roofing installation and associated work, meet at project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in and around roofing that must precede or follow roofing work (including mechanical work if any), Architect, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the work, including (where applicable) Owner's insurers, test agencies, and governing authorities.

1. Review foreseeable methods and procedures related to roofing work, including but not necessarily limited to the following:

   a. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations, and other preparatory work performed by other trades.
   b. Review structural loading limitations of steel deck and inspect deck for loss of flatness and for required mechanical fastening.
   c. Review roofing system requirements (drawings, specifications, and other contract documents).
   d. Review required submittals, both completed and yet to be completed.
   e. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

f. Review required inspection, testing, certifying, and material usage accounting procedures.
g. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not a mandatory requirement).

1.5 PROJECT CONDITIONS

A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store and handle roofing materials in a manner that will ensure that there is no possibility of significant moisture pickup. Store in a dry, well-ventilated, weather-tight place. Unless protected from weather or other moisture sources, do not leave unused felts on the roof overnight or when roofing work is not in progress. Store rolls of felt and other sheet materials on end on pallets or other raised surface. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.

1.7 WARRANTIES

A. Manufacturer's Warranty: Submit executed copy of roofing manufacturer's standard "Limited Service Warranty" agreement including flashing endorsement, signed by an authorized representative of built-up roofing system manufacturer, on form that was published with product literature as of date of Contract Documents, for the following period of time:

1. 20 years after date of Substantial Completion.

PART 2 - PRODUCT

2.1 ROOF INSULATION

B. Polyisocyanurate Foam Board Insulation: Rigid boards of minimum 2.0 lb./cu. ft. density polyisocyanurate based foam core, permanently bonded to roofing felt facer sheets. Provide in thickness indicated, with minimum aged K-value of 0.17 (when conditioned per RIC/TIMA Bulletin NO. 281-1).

2.2 BUILT-UP ROOF MEMBRANE SYSTEM

C. Insulated-Deck Asphalt/Glass-Fiber/Aggregate Roofing (IAGA-BUR): Provide built-up aggregate-surfaced roof system with asphalt bitumen, vented base sheet, and 3 plies glass-fiber felts for lay-up as follows:

1. Base Sheet: Single ply of asphalt-coated heavy-weight glass fiber felt.
2. Base Sheet: Single ply of asphalt-coated heavy-weight glass- fiber base sheet.
3. Ply Felts: 3 plies of asphalt-impregnated glass-fiber felts, complying with ASTM D 2178, Type IV.

4. Bitumen: Roofing asphalt, complying with ASTM D 312, Type II.
5. Comply with NRCA Roofing and Waterproofing Manual, Specification Plate 42 - IAGA, Diagram A.
6. Available Products: Subject to compliance with requirements, built-up asphalt roofing system systems that may be incorporated in the work include, but are not limited to, the following:
7. Products: Subject to compliance with requirements, provide one of the following built-up asphalt roofing system systems:
   a. Celotex Corp.; Specification G.A.-3-4-C-G.
   b. GAF Corp.; Specification 105-G.
   c. Genstar Roofing Products Co.; Specification AAA-3-2.
   d. Manville Building Materials Corp.; Specification 4GIG.
   e. Owens-Corning Fiberglas Corp.; Specification 43-IG.
   f. Tamko Asphalt Products, Inc.; Specification 503.

2.3 BUILT-UP ASPHALT ROOFING SYSTEM EDGE/PENETRATION MATERIALS

A. Roofing Cement: Asphaltic cement, asbestos free; ASTM D 4586.

B. Glass Fiber Fabric: 1.5-pound (minimum) sheet, of woven glass fiber, impregnated with asphalt (ASTM D 1668).

C. Preformed Edge Strips: Rigid insulation units matching roof insulation, or asphalt-impregnated organic fiber insulation units, molded to form 3-1/2-inch by 3-1/2-inch by 45-degree cant strips and 1-5/8-inch by 18-inch tapered edge strips to receive roofing ply-sheet courses and lift edges above main roofing surface.

2.4 SHEET METAL ACCESSORY MATERIALS

A. Refer to Section 07600, "FLASHING AND SHEET METAL."

2.5 MISCELLANEOUS MATERIALS

B. Surfacing Aggregate: Crushed stone, free of sharp edges and complying with ASTM D 1863.

   1. Where ASTM D 1863 aggregate is not available, provide aggregate complying with gradation sizes 6, 7, and 67 of ASTM D 448, provided that moisture content by weight is 3 percent or less and aggregate meets other requirements of ASTM D 1863.

C. Wood Members, Units: Comply with requirements of "Carpentry" sections of these specifications for nailers, walkway units, and other wood members indicated as roofing system work. Provide wood pressure treated with waterborne preservatives for above-ground use (AWPB LP-2).

D. Substrate Joint Tape: 6-inch or 8-inch-wide coated glass-fiber joint tape.

E. Mastic Sealant: Polyisobutylene (plain or bituminous modified), nonhardening, nonmigrating, nonskinning, and nondrying.

F. Asphaltic Primer: Comply with ASTM D 41.

G. Fasteners: Provide industry-standard types of mechanical fasteners for built-up asphalt roofing system work, tested by manufacturer for required pull-out strength where applicable and compatible with deck type and roofing products used. Provide either 1-inch-diameter nail heads

or 1-3/8-inch-diameter by 30-gage sheet metal caps for nails used to secure base sheets, felts, or insulation boards of roofing system.

2.6 FABRICATION OF SHEET METAL ACCESSORIES

A. SMACNA and NRCA Details: Conform work with details shown and with applicable fabrication requirements of "Architectural Sheet Metal Manual" by SMACNA. Comply with installation details of "Roofing and Waterproofing Manual" by NRCA.

B. Provide 4-inch-wide flanges for setting on built-up asphalt roofing system membrane with concealment by composition stripping.

C. Fabricate work with flat-lock soldered joints and seams; except where joint movement is necessary, provide 1-inch-deep interlocking hooked flanges filled with mastic sealant.

D. Fabricate roof insulation vents with 4-inch-diameter stack, 12 inches high, filled with glass-fiber insulation. Equip stack with 6-inch-diameter by 3-inch-high weatherproof vent cap.

E. Fabricate gravel "rings" and aggregate divider strips with 1-inch-high standing leg of folded sheet metal, notched from top with 5/8-deep "V" notches. Space notches 3 inches o.c. where strip intersects flow of water on roof, 6 inches o.c. elsewhere. Fabricate rings to sizes and shapes indicated (but not less than 36 inches square), and fabricate running strips (as shown) in maximum 4-foot lengths for butt-joint installation (1/4 inch gaps).

F. Fabricate penetration sleeves with minimum 8-inch-high stack, of diameter 1 inch larger than penetrating element. Counterflashing is specified as work of another section of these specifications.

PART 3 - EXECUTION

3.1 INSPECTION OF SUBSTRATE

A. Examine substrate surfaces to receive built-up roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

1. Verify that flatness and fastening of metal roof decks comply with the following:

a. Top Flanges: No concavity or convexity in excess of 1/16 inch across any 3 adjacent flanges.
b. Side Laps: Properly nested and mechanically fastened at a maximum spacing of 3 feet o.c.
c. End Laps: Minimum 2-inch laps located over and fastened to supports.
d. Deck secured to each supporting member in every other rib (maximum spacing 12 inches o.c.) with puddle welds or approved mechanical fasteners.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Insurance/Code Compliance: Install built-up roofing system for (and test where required to show) compliance with governing regulations and with the following insurance requirements:

1. Factory Mutual requirements for "Class I" or "Noncombustible," including zoned wind

resistance as specified by FM.

2. Underwriters Laboratories "Fire Classified" and "Class 90" wind uplift resistance.

B. Coordinate the installation of insulation, roofing sheets, flashings, stripping, coatings, and surfacings so that insulation and felts are not exposed to precipitation or exposed overnight. Provide cut offs at end of each day's work, to cover exposed felts and insulation with a course of coated felt with joints and edges sealed with roofing cement. Remove cut offs immediately before resuming work. Glaze-coat installed ply-sheet courses at end of each day's work where final surfacing has not been installed.

C. Asphalt Bitumen Heating: Heat and apply bitumen in accordance with equiviscous temperature method ("EVT Method") as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (plus 5 deg F or 14 deg C, at point of application) more than one hour prior to time of application. Discard bitumen that has been held at temperature, exceeding finished blowing temperature (FBT) for a period exceeding 3 hours. Determine flash point, finished blowing temperature and EVT or bitumen, either by information from bitumen producer or by suitable tests, and determine maximum fire-safe handling temperature and do not exceed that temperature in heating bitumen; but in no case heat bitumen to a temperature higher than 25 deg F (14 deg C) below flash point. For aggregate-surfaced pour coats of bitumen, limit application temperature to minimum required for proper embedment of aggregate and maximum that will permit retention of a coating of weight required (depends on slope of surface). Keep kettle lid closed except when adding bitumen.

D. Bitumen Mopping Weights: For interply mopping, and for other moppings except as otherwise indicated, apply bitumen at the rate of 25 pounds of asphalt (plus or minus 25 percent on a total-job average basis) per roof square (100 sq. ft.) between plies.

E. Substrate Joint Penetrations: Do not allow bitumen to penetrate substrate joints and enter building or damage insulation, vapor barriers (retarders), or other construction. Where mopping is applied directly to a substrate, tape joints or, in the case of steep asphalt, hold mopping back 2 inches from both sides of each joint.

F. Cutoffs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of 2 plies of No. 15 roofing felt set in full moppings of hot bitumen; remove at beginning of next day's work. Glaze-coat areas of completed organic ply sheets which cannot be flood-coated and aggregate- surfaced before end of each day's work.

3.3 VAPOR RETARDER INSTALLATION

A. Vapor Retarder on Steel Decks: Mechanically fasten one course of perlite board roof insulation in thickness as required to span deck flutes, but not less than 1 inch thick. Use FM-approved fasteners specifically designed for securing insulation boards to steel roof deck and driven through metal discs. Space fasteners in accordance with FM requirements for Windstorm Resistance Classification I-90. Locate end joints of insulation over deck flutes.

B. Over insulation board, apply 2 plies of No. 15 asphalt-impregnated roofing felt, lapping each felt 19 inches over the preceding one. Solid mop 20 pounds per square (plus or minus 25 percent) of Type III asphalt between felts and to insulation board. Glaze-coat completed surface with Type III asphalt at rate of 20 pounds per square (plus or minus 25 percent).

1. Comply with NRCA Built-up Roofing Manual "Specification 11-VR" and "Diagram VR-C."
2. Apply 2-course stripping of glass-fiber fabric and roofing cement at obstructions and penetrations through vapor barrier.

3.4 INSTALLATION OF INSULATION

A. General: Comply with insulation manufacturer's instructions and recommendations for the handling, installation, and bonding or anchorage of insulation to substrate.

B. Set insulation in hot solid mopping of Type III asphalt, applied within temperature range of EVT plus or minus 25 deg F (14 deg C) and at rate of 25 pounds (plus or minus 15 percent on the job, all-job average basis) per 100 sq. ft. Run long joints of insulation in continuous straight line, perpendicular to roof slope, with end joints staggered between rows.

C. Secure insulation to deck using mechanical fasteners specifically designed and sized for attachment of specified board type insulation to deck type shown. Fasten insulation over entire area of roofing at spacing as required by FM for Windstorm Resistance Classification I-90. Run long joints for insulation in continuous straight lines, perpendicular to roof slope with end joints staggered between rows.

D. Two-Layer Installation: Where overall insulation thickness is 2 inches or greater, install required thickness in two layers with joints of second layer staggered from joints of first layer a minimum of 12 inches each direction. Install second layer in full mopping of hot Type III asphalt, applied within temperature range of EVT plus or minus 25 deg F (14 deg C) and at rate of 25 pounds (plus or minus 25 percent on total-job basis) per 100 sq. ft.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush with ring of drain.

3.5 ROOF MEMBRANE INSTALLATION

A. Shingling of Plies: Except as otherwise indicated, install membrane with ply sheets shingled uniformly to achieve required number of thickness of membrane throughout. Shingle in proper direction to shed water on each large area of roofing, where slope is significant (over 1/2 inch).

B. Cant Strips/Tapered Edge Strips: Except as otherwise shown, install preformed 45-deg insulation cant strips at junctures of built-up asphalt roofing system membrane with vertical surface. Provide preformed, tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

C. Base Sheet: Install one lapped course of base sheet. Mop to non- nailable substrate with steep asphalt, except use special adhesive where indicated.

D. Interply Sheets: Install the number and type(s) of ply sheets (felts) indicated, lapped (shingled) amount specified to form a continuous, uniform membrane with continuous bitumen moppings between sheets so that ply sheet does not touch ply sheet. As ply-sheet membrane is laid up, glaze-coat top surface with 10-lb./sq. ft. mopping of same bitumen.

1. Mop base of membrane to base sheet, or directly to substrate if no base sheet used.
2. Extend built-up roofing membrane to 2 inches (nominal) above top edge of cant strip and terminate.
3. Provide a folded-back envelope at edges and penetrations of built-up roofing membrane where it is not turned up on a tapered strip, to provide positive protection against flow of bitumen into building or off the edge. Extend base sheet to form envelope or, where no base sheet is provided, install one ply of coated felt, set in steep asphalt with joints sealed. Seal corners and other interruptions of envelope with large beads of roofing cement to provide positive protection against flow of bitumen.

4. Nail edges of roofing membrane to wood blocking at perimeter edges of roof prior to installing metal gravel stops/fascias. Space nails at minimum 8 inches o.c.

E. Set-On Accessories: Where small roof accessories are set on built-up roofing membrane, set metal flanges in a bed of roofing cement and seal penetration of membrane with bead of roofing cement to prevent flow of bitumen from membrane.

3.6 COMPOSITION FLASHING AND STRIPPING

A. Install composition stripping where metal flanges are set on roofing. Provide not less than one ply of glass-fiber fabric and one ply of reinforced glass-fiber flashing; set each in a continuous coating of roofing cement and extended onto the deck 6 inches and 4 inches, respectively. Except where concealed by aggregate surfacing or elastic flashing, apply a heavy coating of roofing cement over composition stripping.

B. Roof Drains: Fill clamping ring base with a heavy coating of roofing cement. Set lead flashing sheet in a bed of roofing cement on completed built-up roofing ply sheet courses, with lead sheet clamped in roof drain ring and extended 12 inches onto roofing. Cover lead sheet with composition stripping, with plies extended 4 inches to 6 inches beyond edges of lead sheet. Provide composition stripping of gravel stop rings (if any).

C. Allow for expansion of running metal flashing and edge trim which adjoins roofing. Do not seal or bond membrane or composition flashing and stripping to metal flanges over 3 feet in length.

D. Counter-flashings: Counter-flashings, cap flashings, expansion joints, and similar work to be coordinated with built-up roofing work are specified in other sections of these specifications.

E. Roof Accessories: Miscellaneous sheet metal accessory items, including insulation vents and other devices, and major items of roof accessories (if any) to be coordinated with built-up roofing system work, are specified in other sections of these specifications.

F. Aggregate Surfacing: Promptly after completion of built-up roof membrane, edge treatment and set-on accessories in each substantial area of roofing, flood-coat surface as indicated and, while each small area is hot and fluid, cast the following approximate weight of aggregate in a uniform course.

1. Flood Coat: 60 pounds per square of Type I or Type II asphalt, except provide steep asphalt where slope exceeds 3/4 inch per foot.

2. Aggregate: Gravel, averaging 500 pounds per square.

3. Do not install flood coating of bitumen and aggregate surface source at edges of roofing until composition flashing and stripping work has been completed. Glaze-coat organic ply sheet courses where surfacing cannot be installed on the same day. Delay aggregate surfacing only as long as necessary to substantially complete edge work and tests (if any).

END OF SECTION 07512

SECTION 07600 - FLASHING AND SHEET METAL

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. This Section includes the following:
   1. Pre-finished metal counter flashing; and base flashing (if any).
   2. Pre-finished exposed metal trim/fascia units.
   3. Miscellaneous sheet metal accessories.
   4. Elastic flashing.

B. Integral masonry flashings are specified as masonry work in sections of Division 4.

C. Roofing accessories which are installed integral with roofing membrane are specified in roofing system sections as roofing work.

D. Roof accessory units of pre-manufactured, set-on type are specified in Division 7 Section "Roof Accessories".

1..3 SUBMITTALS

A. Product data; Flashing, Sheet Metal, and Accessories: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

B. Samples of the following flashing, sheet metal, and accessory items:
   1. 8 inch square samples of specified sheet materials to be exposed as finished surfaces.

C. Shop drawings showing layout, profiles, methods of joining, and anchorages details, including major counter-flashings, trim/fascia units, gutters, downspouts, scuppers and expansion joint systems. Provide layouts at 1/4 inch scale and details at 3 inch scale.

1..4 PROJECT CONDITIONS

A. 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.

PART 2 - PRODUCTS

1..1 SHEET METAL FLASHING AND TRIM MATERIALS

A. Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 526 except ASTM A 527 for lock-forming, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 0.0359 inch thick (20 gage) except as otherwise indicated. All exposed surfaces shall be pre-finished.

2..2 REGLETS

A. Metal units of type and profile indicated compatible with flashing indicated, non-corrosive.

PART 3 - EXECUTION

1..1 INSTALLATION REQUIREMENTS

A. 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 which will be permanently watertight and weatherproof.

B. Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.

1. Install counterflashing in reglets, either by snap-in seal arrangement, or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

C. Install elastic flashing in accordance with manufacturer's recommendations. Where required, provide for movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.

D. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches o.c. Fabricate seams at joints between units with minimum 3 inch overlap, to form a continuous, waterproof system.

E. Install continuous gutter guards on gutters, arranged as hinged units to swing open for cleaning gutters. Install "beehive" type strainer-guard at conductor heads, removable for cleaning downspouts.

1..2 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

B. Protection: Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal 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 07700 - ROOF SPECIALTIES AND ACCESSORIES

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 DESCRIPTION OF WORK:

.

A. Types of units specified in this section include the following:

1. Roof hatches.
2. Prefabricated curb and equipment support units.

B. Refer to roofing system sections of these specifications for roofing accessories to be built into roofing system (not work of this section).

PART 2 - PRODUCTS

1..1 GENERAL PRODUCT REQUIREMENTS:

A. Provide manufacturers' standard units, modified as necessary to comply with requirements. Shop fabricate each unit to greatest extent possible.

1..2 MATERIALS, GENERAL:

A. Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 525, G90 hot-dip galvanized, mill phosphatized.

B. Insulation: Manufacturer's standard rigid or semi-rigid board of glass fiber of thicknesses indicated.

C. Wood Nailers: Softwood lumber, pressure treated with water-borne preservatives for above-ground use, complying with AWPB LP-2; not less than 1-1/2" thick.

D. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.

E. Gaskets: Tubular or fingered design of neoprene or polyvinyl chloride, or block design of sponge neoprene.

F. Bituminous Coating: FS TT-C-494A or SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coating.

G. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.

H. Elastomeric Sealant: Generic type recommended by unit manufacturer, which is compatible with joint surfaces; comply with FS TT-S-00227E, TT-S-00230C, or TT-S-001543A.

I. Roofing Cement: ASTM D 2822, asphaltic.

1..3 PREFABRICATED ROOF HATCHES:

A. General: Fabricate units of sizes shown, single-leaf type unless otherwise indicated, for 40 lbs. per sq. ft. external loading and 20 lbs. per sq. ft. internal loading pressure. Frame with 9" high integral-curb double-wall construction with 1-1/2" insulation, cant strips and cap flashing (roofing counter-flashing), with welded or sealed mechanical corner joints. Provide double-wall cover (lid) construction with 1" insulation core. Equip units with complete hardware set including hold-open devices, interior padlock hasps, and both interior and exterior latch handles. Provide gasketing. Fabricate units of following materials:

1. Materials: Zinc-coated steel sheets.
2. **Size: 30” x 54”**
3. **Provide hatch rail system (safety rails) per manufacturer’s specifications and which meets OSHA-required compliance.**

B. Manufacturer: Subject to compliance with requirements, provide prefabricated roof hatch units by one of the following:

1. Bilco Co.; New Haven, CT; Model NB, 30” x 54”;
2. Bohem Skylites, Inc.; Burlington, NJ
3. Bristol Fiberlite Industries; Santa Anna, CA
4. Dur-Red Products; Cudahy, CA; Model SSH 30” x 54”
5. Milcor, Inc.; Lima, OH
6. O'Keefe's, Inc.; San Francisco, CA

1..4 PREFABRICATED CURBS/EQUIPMENT SUPPORTS:

A. Comply with loading and strength requirements as indicated where units support other work. Coordinate dimensions with rough-in sheets or shop drawings of equipment to be supported. Fabricate of structural quality sheet steel (ASTM A 570, Grade as required) with hot dip galvanizing after fabrication.

1. Fabricate with welded or sealed mechanical corner joints. Provide complete with cant strips and base profile coordinated with roof insulation thickness. Provide preservative-treated wood nailers at tops of curbs, coordinate with thickness of insulation and roof flashing as indicated, tapered as necessary to compensate for roof deck slopes of 1/4" per ft. and less.

2. Except as otherwise indicated or required for strength, fabricate units of minimum 14-gage (0.0747") metal, and to minimum height of 12".

B. Manufacturer: Subject to compliance with requirements, provide prefabricated curbs/equipment supports by one of the following:

1. Custom Curb, Inc.; Chattanooga, TN
2. The Pate Company; Broadview, IL
3. ThyCurb Div./ThyBar Corp.; Addison, IL

PART 3 – EXECUTION

1..1 INSTALLATION:

A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units, and vapor barriers, roof insulation, roofing and flashing; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

B. Flange Seals: Except as otherwise indicated, set flanges of accessory units in a thick bed of roofing cement, to form a seal.

C. Cap Flashing: Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counter-flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

END OF SECTION 07700

SECTION 07810 - INSULATED TRANSLUCENT SKYROOF SYSTEM

PART 1 - GENERAL

1..1 RELATED DOCUMENTS:

A. Drawings and general provisions.

1..2 DESCRIPTION OF WORK:

A. Supply all labor and materials required to deliver and install the insulated translucent skyroof system. The following major items included are:

1. Insulated translucent pre-engineered approximate 145 square foot pyramidal skyroof system (contractor shall verify system dimensions prior to system manufacturing).
2. Insulated translucent skyroof panels in a custom formation.
3. Installation system (sealants, aluminum extrusion jointing membranes and fasteners).
4. Aluminum counter-flashing.

1..3 SUBSTITUTIONS

A. Requests for substitutions must be approved by addendum no later than 10 days prior to bid due date and in keeping with Division 1 (Substitutions) of the specifications.

1..4 GUARANTEE

A. In addition to the Guarantee required by the General Conditions, the installer/supplier shall provide a 5 year material and labor guarantee against de-lamination of the panel and a 3 year material and labor guarantee against leaks in the insulated skyroof system.

1..5 QUALITY ASSURANCE:

A. Manufacturer's and Erector's Qualifications:

1. Skyroof system manufacturer must be listed by International Conference of Building Officials and the panels shall be manufactured under an ICBO approved quality control program monitored by an ICBO approved control agency for sandwich panel construction.
2. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of similar materials, for a period of at least 15 consecutive years; and which can show evidence of these materials being satisfactorily used on at least 6 projects of similar size, scope and type within such a period. At least 3 of the projects shall have been in successful use for 10 years or longer.
3. Erection shall be by an installer which has been in the business of erecting similar

materials for at least 5 consecutive years; and can show evidence of satisfactory completion of projects of similar size and scope.

B. Performance Requirements: The manufacturer shall be responsible for the configuration and fabrication of the skyroof system. Design wind load to be based on 100 MPH windspeed, and shall comply with ANSI A58 requirements.

1..6 SUBMITTALS

A. Submit shop drawings and color samples in accordance with Division I, Submittals.

B. Test reports to be furnished by skyroof system manufacturer in accordance with Division I, Submittals: The manufacturer shall submit certified test reports, made by an independent testing organization for each type and class of skyroof system. Reports shall verify that the material will meet all performance requirements of this specification. Previously completed test reports will be acceptable if current and indicative of products used on this project. Test reports required are:

1. Flame Spread and Smoke Development (ASTM-E-84).
2. Burn Extend (ASTM D-635).
3. Color Difference (ASTM D-2244).
4. Impact Strength (SPI Method).
5. Bond Strength (ASTM C-297 and ASTM D-1002).
6. Accelerated Aging (ASTM D-1037).
7. Beam Bending Strength (ASTM E-72).
8. Insulated "U" Factor (ASTM C-236).

1..7 PRODUCT HANDLING:

A. Store skyroof panels on the long edge, several inches above the ground, blocked and under cover to prevent warping.

PART 2 - PRODUCTS

2..1 TRANSLUCENT FACING

A. Translucent faces shall be manufactured by insulated skyroof system fabricator specifically for architectural use.

B. Flammability: The interior face sheet shall have a flamespread rating no greater than 45 and smoke development no greater than 350 when tested in accordance with ASTM E-84.

C. Weatherability

1. Overall degradation factor shall be 10 or less according to ASTM D-3841, Method B.
2. The exterior face shall be color stable the full thickness, before and after application

of special coatings or protective films, and not change color more than 3.0 Adams Units (Delta E by ASTM D-2244) after 5 years outdoor weathering South Florida at 7 degrees facing south, determined by the average of at least three samples.

3. The face sheet shall not darken more than .2 (DELTA L by ASTM D-2244) when exposed to 150 degrees for two weeks.
4. The exterior faces shall have a special acrylic protective surface--minimum thickness 1.2 mils--for maximum resistance to erosion and weather, applied in the factory under controlled temperature conditions. This coating must be fully field refinishable if damaged.

D. Appearance:

1. The face sheets shall be uniform in color to prevent splotchy appearance.
2. Exterior face sheets shall be .070" thick and crystal in color. Interior face sheets shall be .045" thick and white in color. Faces shall not vary more than +10% in thickness.
3. The faces shall be completely free of ridges and wrinkles which prevent proper surface contact in bonding to the aluminum grid core. Clusters of air bubbles and pinholes which collect moisture and dirt will not be acceptable.

E. Strength: The exterior face sheet shall be uniform in strength and repel an impact equal to 100 ft. lbs. in accordance with SPI Shatter Resistance Test.

2..2 NON-COMBUSTIBLE GRID CORE

A. The aluminum I-beams shall be 6063-T6 with provision for mechanical interlocking of muntin-mullion and perimeter to prevent high and low intersections which do not allow full bonding surface to contact with face material.

Width of I-beam shall be no less than 7/16". Aluminum I-beam for the grid shall be machined to tolerances of not greater than +.002". A welded or web interlocked grid core shall not be acceptable due to unevenness at muntin-mullion intersections.

2..3 ADHESIVE

A. The laminate adhesive shall be heat and pressure type engineered for structural sandwich panel use. Adhesive shall pass testing requirements specified by the International Conference of Building Officials "Acceptance Criteria for Sandwich Panel Adhesive". Minimum strength shall be:

1. 750 PSI Tensile strength by ASTM C-297 before and after 2 exposures to 6 cycles each of the aging conditions prescribed by ASTM D-1037.
2. 550 PSI shear strength average of all 5 separate exposures by ASTM D-1002:

   a. 50% relative humidity at 73° F.
   b. Accelerated Aging by ASTM D-1183.
   c. 182° F.
   d. Full Cycle Soak.
   e. 500 Hour Oxygen Bomb.

2..4 PANEL CONSTRUCTION

A. Skyroof panels at all locations shall have a thickness of 2-3/4" with a "U" factor of 0.24, light transmission of 20% and shading coefficient of 0.27. Exterior color to be crystal. Interior color to be white.

B. Skyroof panels shall be a true sandwich panel of flat fiberglass sheet bonded to a grid core of mechanically interlocking aluminum I-beams and shall be laminated under a controlled process of heat and pressure.

C. Skyroof panels and aluminum perimeter frame shall be pre-assembled where practical and sealed at the factory. Panels should be shipped to the job site in rugged shipping units and shall be ready for erection.

D. Translucent sandwich panel deflection shall not exceed 3.5" at 35 lbs. per sq. ft. loading and shall not exceed 0.10" set deflection five (5) minutes after load release per ASTM E-72 with a 12' clearspan.

E. Grid pattern shall be 12" x 24" and symmetrical.

F. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge. In order to insure bonding strength, white spots at intersections of muntions and mullions shall not exceed 4 for each 40 square feet of panel, nor shall they be more than 3/64" in width.

2..5 BATTENS AND PERIMETER CLOSURE SYSTEMS

A. Extruded 6063-T6 and 6063-T5 aluminum screw clamp-tite closure system.

B. All battens and aluminum perimeter closures to be supplied with #410 Type A, stainless steel screws (excluding final fasteners to the building) and shall be factory sealed to the panels. Aluminum battens and cap plates shall be field installed.

C. All exposed aluminum to be corrosion resistant finish--color is white.

D. Receiving channels for self-tapping stainless steel screws to be continuous the length of each member and extruded as part of the member. Threaded receiving channel shall not be acceptable.

2..6 FLEXIBLE SEALING TAPE

A. Sealing tape shall be manufacturer's standard pre-applied to closure system at the factory under controlled conditions.

PART 3 - EXECUTION

3..1 PREPARATION

A. The General Contractor shall prepare openings including isolating dissimilar materials from aluminum system which may cause damage by electrolysis.

B. Inspect all surfaces to receive skylight components and report all defects in writing to the General Contractor and Architect at the time of discovery. Starting work implies acceptance of surfaces as satisfactory.

3..2 ERECTION

A. The erector shall erect the translucent skyroof systems in strict accordance with approved shop drawings as supplied by manufacturer. Fastening and sealing shall be in strict accordance with manufacturer's shop drawings. All aluminum shall be cleaned before sealants are applied.

B. After other trades have completed work on adjacent material, carefully inspect translucent panel installation and make adjustments necessary to insure proper installation and weathertight installation.

C. Project dissimilar metals from galvanic corrosion by means of zinc chromate or bituminous paint or butyltape isolators.

D. All staging, lifts and hoists required for the complete insulated skyroof system installation, including staging, etc., necessary for field measuring, shall be provided by, set up and maintained by the erecting contractor.

E. At the time the skylight enclosures have been completed, all responsibility for physical protection of the skylights will be the responsibility of the General Contractor.

F. Final cleaning shall be the sole responsibility of the Sub-Contractor.

END OF SECTION 07810

SECTION 07900 - JOINT SEALERS

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 joint sealers for the following locations:

1. Exterior joints in vertical surfaces and non-traffic horizontal surfaces as indicated below.
   a. Control and expansion joints in unit masonry.
   b. Joints between different materials listed above.
   c. Perimeter joints between materials listed above and frames of doors and windows.

2. Exterior joints in horizontal traffic surfaces as indicated below urethane sealants typical):
   a. Control, expansion, and isolation joints in cast-in-place concrete slabs for floors and planters.

3. Interior joints in vertical surfaces and horizontal non-traffic surfaces as indicated below:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Tile control and expansion joints.
   d. Vertical control joints on exposed surfaces of interior unit masonry walls and partitions.
   e. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
   f. Perimeter joints of toilet fixtures.

4. Interior joints in horizontal traffic surfaces as indicated below:
   a. Control and expansion joints in cast-in-place concrete slabs.
   b. Control and expansion joints in tile flooring.

1..3 SYSTEM PERFORMANCES:

A. Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

1..4 PROJECT CONDITIONS:

A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:
   1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40 deg F (4.4 deg C).

B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less than allowed by joint sealer manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

1..1 MATERIALS, GENERAL:

A. 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.

B. Colors: Provide color of exposed joint as selected by Architect from manufacturer's standard colors.

1..2 ELASTOMERIC JOINT SEALANTS:

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses.

B. One-Part Nonacid-Curing Silicone Sealant: Type S, Grade NS, Class 25, and complying with the following requirements for Uses and additional joint movement capability:

1. Uses NT, M, G, A, and, as applicable to joint substrates indicated, O.

2. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for Uses indicated:

a. 50 percent movement in both extension and compression for a total of 100 percent movement.

C. One-Part Mildew-Resistant Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide; intended for sealing interior joints with nonporous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes.

1..3 JOINT SEALANT BACKING:

A. General: Provide sealant backings of material and type which are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-waxing, non-extruding strips of flexible, non-gassing plastic foam of material indicated below; nonabsorbent to water and gas; and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

1. Either open-cell polyurethane foam or closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer, for cold-applied sealants only.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

PART 3 - EXECUTION

1..1 EXAMINATION:

A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

1..2 PREPARATION:

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:

1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellants; water; surface dirt; and frost.

2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.

3. Remove laitance and form release agents from concrete.

4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile; and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

1..3 INSTALLATION OF JOINT SEALERS:

A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications and conditions indicated.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.

    a. Do not leave gaps between ends of joint fillers.
    b. Do not stretch, twist, puncture, or tear joint fillers.
    c. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

END OF SECTION 07900

DIVISION 8 - DOORS AND WINDOWS

Section 08100	**Hollow Metal Doors and Frames**
Section 08211	**Flush Wood Doors**
Section 08310	**Access Doors and Panels**
Section 08360	**Sectional Overhead Doors (Motorized)**
Section 08380	**Impact Traffic Doors**
Section 08410	**Aluminum Entrances and Storefronts**
Section 08520	**Aluminum Windows**
Section 08710	**Finish Hardware**
Section 08711	**Controlling Hardware**
Section 08800	**Glass and Glazing**

SECTION 08100 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL REQUIREMENTS

1..1 SCOPE:

A. Furnish and install all lightweight doors and hollow metal frames as shown on the drawings and as specified herein.

1..2 SHOP DRAWINGS:

A. Per Division 1.

1..3 COORDINATION:

A. Coordinate work and scheduling of the work of this section with other trades for anchorage and location of hardware.

1..4 INSPECTION:

A. Examine all subsurfaces to receive work and report in writing to general contractor, with a copy to Architect, any conditions detrimental to work. Failure to observe this injunction constitutes a waiver to any subsequent claims to the contrary and will make this contractor responsible for any corrections Architect may require. Commencement of work will be construed as acceptance of all subsurfaces.

1..5 DELIVERY:

A. Frames shall be stored in an upright position, under cover, on the building site, on wood sills or on the floor, in a manner that will prevent rust and damage. Avoid creating a humidity chamber by using a plastic or canvas shelter and by not venting the area covered. Remove any damaged items for site and replace at no cost to Owner.

B. All metal frames and metal doors shall be provided by one manufacturer.

PART 2 - PRODUCTS

2..1 DOOR FRAMES:

A. Construct to shapes and sizes shown, meeting various wall thicknesses.

B. Materials: All materials used in the fabricating of pressed steel shall be free from defects impairing their strength, durability or appearance. Frames shall conform to Commercial Standard CS242-62 or PS4-65.

C. Metal Door Frames: Shall be fabricated from 14 gauge steel for single and double doors. Frames shall be combination type with integral stop and trim. Head assemblies to be reinforced internally as each miter joint with 16 gauge channel-shaped reinforcements. Frames shall be one-piece welded construction. Hollow metal frames for windows shall be of similar construction.

D. Frames: Shall be equipped with one welded-in floor anchor in each jamb. Three field inserted steel snap-in anchors (maximum of 24" o.c.) shall also be provided for each jamb. Anchors shall be of the proper type for the particular construction involved (i.e., wood frame, masonry, concrete or steel stud).

E. Drywall Frame: Shall be provided for installation after the wall is erected. Corners shall be supplied with an oval countersunk head sheet metal screw for securing the header and jambs. Headers and jambs shall have mating tabs and slots for alignment f the assembly. All corners shall present neatly mitered joints. Each jamb is provided with two welded-in steel stiffeners to maintain a tight grip on the wall and shall be equipped with weld-in sill anchors.

F. Provide angle spreader for frames during shipping, handling and installation.

2..2 HARDWARE PREPARATION:

A. Make cutouts for required hardware specified under Section 08700 FINISH HARDWARE from templates furnished thereunder. Reinforce butt cutouts with minimum 3/16" thick steel plate, drilled, tapped and welded in place. Provide strike stops on frames with holes for three (3) rubber door silencers; on double door frames, provide for two (2) silencers per door at head. Reinforce head section for installation of closers. Plaster guards shall be installed in back of all applicable hardware cutouts. Frames shall be reinforced for surface applied hardware. Reinforcement shall comply with S.D.I. recommendations.

2..3 LABELED FRAMES:

A. When noted or required, provide Underwriters Laboratories, Inc., labels for the frame and/or sidelights for the class of opening indicated. Construction details and hardware applications authorized by the Underwriters Laboratories shall take precedence over project details or specifications. Door and frames must bear label.

2..4 GALVANIZED (ALL EXTERIOR HOLLOW METAL FRAMES AND ALL INTERIOR FRAMES, WHERE NOTED):

A. Frame members shall be manufactured of hot-dip galvanized material in the 0.6 ounce coating class, conforming to ASTM designations A-525 and A-526 and Federal Specification 00-2-775D, Type I, Class D (except marking). The material shall be treated in the mill to insure superior prime paint adhesion. The pretreatment shall conform to Military Specifications MIL-C-490, Amendment 1, and Federal Specification TT-C-490, Grade I.

2..5 METAL DOORS:

A. Construct to sizes shown; provide necessary clearances and bevels to permit operation without binding and to accommodate thresholds where required.

B. Provide one-piece pan shaped face sheets of 16 gauge material, spot welded to 20 gauge reinforcing channels (18 gauge at edges) which are spaced not over 8" o.c. and run full height of doors. Weld continuous 18 gauge stiffener channels at top of all doors and close tops of exterior

frames against water accumulation and make watertight. Pack spaces between reinforcing members with inorganic insulating material to sound deaden doors. Fill joints with mineral filler; finish surfaces smooth and flush. Bevel lock stile 1/8" in 2".

C. Include reinforcements and mortising for required hardware specified under SECTION 08700 - FINISH HARDWARE from templates furnished thereunder. Reinforce butt cutouts with minimum 3/16" thick steel plate, drilled, tapped and welded in place.

D. Construct doors to UL requirements; where scheduled on drawings, provide labels.

E. Provide doors with lights and louvers as shown on drawings. Doors which contain lights and louvers are to be manufactured and reinforced for that purpose. Do not modify flush doors to accept lights and louvers. Provide removable glazing stops on one (1) side only with mitered corners; louvers shall be standard type "V" shaped blades. See "B" above for required minimum construction.

F. Clean thoroughly, fill joints smooth, and prime with factory baked-on neutral gray rust-inhibiting paint tested as per ASTM D-714 and B-117.

PART 3 - EXECUTION

3..1 WORKMANSHIP:

A. All work shall be shop fabricated to required profiles by forming and welding with corners, angles and edges straight and sharp. Fit and fabricate accurately with corners, joints, seams and surfaces free from warp, wave, buckle or other defects.

3..2 SHOP PAINTING:

A. All exposed surfaces shall be cleaned, bonderized and given one baked-on shop coat of gray synthetic primer. Paint back surfaces of frames with heavy-bodied bituminous paint.

3..3 INSTALLATION OF METAL FRAMES:

A. Frame shall be installed by General Contractor. Installation shall be plumb, straight, true, and rigidly secured in place. Frames shall be properly braced until anchored to final support. Provide temporary spreaders.

B. Frames shall be anchored to concrete floors with powder actuated bolts.

C. Backs of frames in masonry or concrete shall be filled solid with grout.

3..4 INSTALLATION OF DOORS:

A. Fit metal doors accurately in their respective frames. Check and readjust operating finish hardware on metal doors just prior to final inspection. Leave work in complete and proper operating condition.

B. Fire rated doors shall be installed with clearances as specified in National Fire Protection Association pamphlet No. 80.

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

3..5 CLEAN-UP:

Per Division 1.

END OF SECTION 08100

SECTION 08211 - FLUSH WOOD DOORS

1.1 General:

A. Quality Standards: Comply with NWWDA I.S.1 and AWI "Architectural Woodwork Quality Standards".

1.2 Products:

A. Manufacturers: Subject to compliance with requirements, provide wood doors by one of the following:

1. Algoma Hardwoods, Inc.
2. Buell Door Company.
3. Cal-Wood Door Div., Timberland Industries, Inc.
4. Eggers Industries, Architectural Door Division.
5. Weyerhauser Company.
6. Oshkosh Architectural Door Company.

B. General Wood Door Product Requirements: Provide doors with same exposed surface material on both faces of each door, unless otherwise indicated.

C. Interior Solid Core Doors for Transparent Finish: As follows:

1. Faces: Natural oak, solid core.
2. AWI Grade: Custom.
3. Edge Construction: Manufacturer's standard laminated edge construction for improved screw-holding capability and split resistance.

D. Shop finish doors.

1. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect and sheen.

a. Finish: Manufacturer's standard finish with performance requirements comparable to AWI System TR-6 catalyzed polyurethane.
b. Staining: Match Architect's sample.
c. Effect: Semi-filled grain finish.
d. Sheen: Satin

END OF SECTION 08211

SECTION 08310 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fire-resistive rated access door and frame units.
2. Non fire-resistive rated access door and frame units.
3. Location(s) of access doors to be determined by Architect and/or Owner.

B. Related Documents: The Contract Documents, as defined in Section 01110 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

1.2 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
1. Product Data: Sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
2. Shop Drawings: Indicate exact position of all access door units. Location(s) to be determined by Architect and/or Owner.

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
1. Project Record Documents: Accurately record the following:
a. Actual locations of all access units.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer: Company specializing in manufacturing Products specified with minimum 5 years documented experience.
2. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect Products.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include the following:
1. J.L. Industries, Bloomington, MN (612) 835-6850. (800) 554-6077.
2. Karp, Maspeth, NY (800) 888-4212.

3. Larsen's Manufacturing Company, Minneapolis, MN (800) 527-7367.
4. Milcor, Holland, OH (800) 861-6452.
5. Elmdor/Stoneman Manufacturing, City of Industry, CA (800) 591-9181.

B. Section 01600 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.2 ACCESS DOORS

A. Non Fire-Rated: 20 gage recessed steel panel doors to accept field finish of drywall. **Size 16" x 20" (to fit in 16" stud spacing).**

B. Fire-Rated Models: 14 gage recessed steel panel doors to accept field finish of drywall. **Size 16" x 20" (to fit in 16" stud spacing).**

2.3 FABRICATION

A. Fabricate frames and flanges of 0.058 inch steel.

B. Fabricate door panels of 0.070 inch single thickness steel sheet.

C. Weld, fill, and grind joints to ensure flush and square unit.

D. Hardware:
1. Hinge: 175 degree stainless steel piano hinge concealed constant force closure spring type.
2. Lock: Screw driver slot for quarter turn cam lock unit.

2.4 FINISHES

A. Base Metal Protection: Prime coat units with alkyd primer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
1. Verify that rough openings for door and frame are correctly sized and located.

C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the United States Postal Service.

3.2 INSTALLATION

A. Install units in accordance with manufacturer's published instructions where indicated on Drawings and required for access.

B. Install frames plumb and level in opening. Secure rigidly in place.

C. Position unit to provide convenient access to concealed work requiring access.

3.3 CONSTRUCTION

A. Interface with Other Work: Coordinate with mechanical, electrical, and other Work requiring access units.

END OF SECTION 08310

SECTION 08360 - SECTIONAL OVERHEAD DOORS (MOTORIZED)

PART 1 - GENERAL

1..1 RELATED DOCUMENTS

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

1..2 SUMMARY

A. The Size and Extent of sectional overhead doors is shown on drawings.

B. Type(s) of sectional overhead doors include the following:

1. Steel frame and insulated steel panels.
2. Motorized operated doors.

1..3 COORDINATION

Coordinate all work with other trades whose work affects or connects with sectional overhead door installation.

1.4 INSPECTION

Examine all surfaces to receive work and report, in writing, to General Contractor, with a copy to Architect, any detrimental conditions. Failure to observe this injunction constitutes a waiver to any subsequent claims to the contrary and holds sectional overhead door contractor responsible for any corrections Architect may require. Commencement of work will be construed as acceptance of all subsurfaces.

1.5 DELIVERY AND STORAGE

Deliver materials to job site in manufacturer's original, unopened packaging and adequately protect against damage while stored in a dry location at the site.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's product data, roughing-in diagrams, and installation instructions for each type and size of overhead door. Include manufacturer's operating instructions and maintenance data.

B. Shop Drawings: Submit shop drawings for special components and installations which are not fully dimensioned or detailed in manufacturer's data.

1.7 QUALITY ASSURANCE

A. Provide each sectional overhead door as a complete unit produced by one manufacturer, including frames, sections, brackets, guides, tracks, counterbalance mechanisms, hardware, operators and installation accessories, to suit openings and head room allowable.

B. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry for installation of units. Provide setting drawings, templates, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

C. See concrete and masonry sections of these specifications for installation of inserts and anchorage devices.

D. Wind Loading: Design and reinforce sectional overhead doors to withstand a 25 lb. per sq. ft. wind loading pressure.

PART 2 - PRODUCTS

2..1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products, which may be incorporated in the work, include, but are not limited to, the following:

1. Clopay Overhead Door Co.
2. Overhead Door Co.
3. Raynor Manufacturing Co.
4. Martin Door Manufacturing, Inc.

2..2 STEEL SECTIONS

A. Construct door sections from galvanized structural quality carbon steel sheets complying with ASTM A 446, Grade A, or ASTM A 526, with a minimum yield strength of 33,000 psi, and a minimum G90 zinc coating complying with ASTM A 525.

1. Steel Sheet Thickness: 16-gage.
2. Exterior Section Face: Ribbed.

B. Fabricate sections from a single sheet to provide units not more than 24" high, and nominal 2" to 3" deep. Roll horizontal meeting edges to a continuous shiplap, rabbeted, or keyed weather seal, with a reinforcing flange return.

C. Enclose open section with 16 ga. galvanized steel channel end stiles welded in place. Provide intermediate stiles, cut to door section profile, spaced at not more than 48" o.c. and welded in place.

D. Reinforce bottom section with a continuous channel or angle conforming to bottom section profile.

E. Reinforce sections with continuous horizontal and diagonal reinforcing, as required by door width and design wind loading. Provide galvanized steel bars, struts, trusses or strip steel, formed to depth, and bolted or welded in place.

F. Insulate inner core of steel sections with manufacturer's standard polyurethane foam type insulation.

1. Enclose insulation with manufacturer's standard steel sheet secured to door panel.

G. Finish door sections as follows:

1. Apply manufacturer's standard factory applied prime and finish coats, applied to interior and exterior door faces.

2..3 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Provide manufacturer's standard galvanized steel track system, sized for door size and weight, and designed for clearances shown. Provide complete track assembly including brackets, bracing and reinforcing for rigid support of ball bearing roller guides, for required door type and size. Slot vertical sections of track at 2" o.c. for door drop safety device. Slope tracks at proper angle from vertical, or otherwise design to ensure tight closure at jambs when door unit is closed. Weld or bolt to track supports.

B. Track Reinforcement and Supports: Provide galvanized steel track reinforcement and support members. Secure, reinforce and support tracks as required for size and weight of door to provide strength and rigidity, and to ensure against sag, sway, and detrimental vibration during opening and closing of doors.

C. Support and attach tracks to opening jambs with continuous angle welded to tracks and attached to wall. Support horizontal (ceiling tracks) with continuous angle welded to track and supported by laterally braced attachments to overhead structural members at curve and end of tracks.

D. Weather Seals: Provide continuous rubber, neoprene, or flexible vinyl adjustable weather-strip gasket at tops and compressible astragal on bottoms of each overhead door.

1. In addition, provide continuous flexible seals at door jamb edges for a fully weathertight installation.

E. Insulated Vision Panels: Except as otherwise indicated, furnish clear tempered or laminated glass vision panels in arrangement shown. Set glass in rubber or neoprene channel glazing strips for metal-framed doors, as required. Provide removable stops of same material as door section frames.

2..4 HARDWARE

A. Provide heavy-duty, rust-resistant hardware, with galvanized or cadmium-plated or stainless steel fasteners, to suit type of door.

B. Hinges: Provide heavy steel hinges at each end stile and at each intermediate stile, per manufacturer's recommendations for size of door. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners

where access to nuts is not possible. Provide double-end hinges, where required, for doors exceeding 16'-0" in width, unless otherwise recommended by door manufacturer.

C. Rollers: Provide heavy-duty rollers, with steel ball bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide roller tires to suit size of track (3" diameter for 3" track; 2" diameter for 2" track) and as follows:

1. Case hardened steel tires, for normal installations.

D. Pull Handles, Locks and Latches: For manually operated doors, furnish lifting handles, locks, and locking device as follows:

1. Lifting Handles: Galvanized steel.
2. Locking Bars: Single side, operable from inside and outside.

E. Fabricate locking device assembly with mortise lock, spring loaded dead bolt, chromium-plated operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.

1. Lock cylinder is specified in other Division-8 sections.

2..5 COUNTERBALANCING MECHANISMS

A. Extension Spring: Hang door assembly for operation by extension spring counterbalance mechanism with aircraft type steel cable over ball-bearing sheaves. Provide oil tempered wired springs with internal safety rods. Combine operation with a spring bumper in each horizontal track to cushion door at end of opening operation.

B. Torsion Spring: Hang door assembly for operation by torsion spring counterbalance mechanism, consisting of adjustable tension tempered steel torsion springs mounted on a case-hardened steel shaft, and connected to door with galvanized aircraft type lift cable.

C. Provide cast aluminum or gray iron casting cable drums, grooved to receive cable. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of shaft with one additional mid-point bracket for shafts up to 16' long and 2 additional brackets at 1/3-points to support shafts over 16' long, unless closer spacing recommended by door manufacturer.

D. Include a spring-loaded steel or bronze cam mounted to bottom door roller assembly on each side, designed to stop door automatically if either cable breaks. Provide either a compression spring or leaf spring bumper installed at end of each horizontal track to cushion door at end of opening operation.

2..6 ELECTRIC DOOR OPERATORS

A. Furnish electric door operator assembly of size and capacity recommended and provided by door manufacturer; complete with electric motor and factory pre-wired motor controls, gear reduction unit, solenoid operated brake, clutch, remote control stations and control devices.

B. Provide hand-operated disconnect or mechanism for automatically engaging sprocket chain operator and releasing brake for emergency manual operation. Include interlock device to automatically prevent motor from operating when emergency sprocket is engaged.

C. Design operator so that motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.

D. Door Operator Type:

1. Provide trolley or drawbar type, V-belt and roller chain and sprocket primary drive, and chain and sprocket secondary drive.

2. Electric Motors: Provide high-starting torque, reversible, constant duty, Class A insulated electric motors with overload protection, sized to move door in either direction, from any position, at not less than 2/3' or more than 1' per second.

   a. Coordinate wiring requirements and current characteristics of motors with building electrical system.
   b. Provide totally enclosed, and instant reversing.

3. Remote Control Station: Provide momentary-contact, 3-button control station with push button controls labeled "open", "close" and "stop".

   a. Provide interior units, full-geared, surface-mounted, heavy- duty, with general purpose NEMA Type 1 enclosure.
   b. Provide exterior units, full-guarded, standard duty, surface- mounted, weatherproof type, NEMA Type 4 enclosure, key-operated.

4. Automatic Reversing Control: Furnish each door with automatic safety switch, extending full width of door bottom, and located within neoprene or rubber astragal mounted to bottom door rail. Contact with switch will immediately reverse downward door travel. Furnish manufacturer's standard take-up reel or self-coiling cable.

   a. Provide electrically actuated automatic bottom bar.

5. Electric Interlock: Provide electrical interlock to prevent motor burnout, or motor mount/door damage, in case lock remains engaged.

2..7 GLAZING

A. Provide two (2) 5" x 24" laminated glass sections per door or as shown on the drawings.

PART 3 - EXECUTION

3..1 INSTALLATION

A. Install door, track, and operating equipment complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports in accordance with final shop drawings, manufacturer's instructions and as herein specified.

B. Fasten vertical track assembly to framing at not less than 24" o.c. Hang horizontal track from structural overhead framing with angle or channel hangers, welded and bolt-fastened in place. Provide sway bracing, diagonal bracing, and reinforcing as required for rigid installation of track and door operating equipment.

C. Upon completion of installation, including work by other trades, lubricate, test and adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

END OF SECTION 08360

SECTION 08380 - IMPACT TRAFFIC DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Double action impact resistant traffic doors, security type.
   2. Door hardware.
   3. Security features.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:
   1. Section 05500 - Metal Fabrications: Steel doorframes for traffic doors.

1.2 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
   1. Product Data: Indicate door materials, thickness, configuration, and hardware.
   2. Shop Drawings:
      a. Indicate dimensions, details of construction, and installation.
      b. Indicate relationship to adjoining related Work where cutting, fitting, reinforcement, and anchorage is required for complete installation.
   2. Samples:
      a. Manufacturer's standard color chart for color selection by Contracting Officer.
   3. Assurance/Control Submittals:
      a. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
      b. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing Products specified with minimum 5 years documented experience.
   2. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect Products.

B. Deliver product in manufacturer's original unopened packages with labels legible and intact.

C. Labels shall identify manufacturer, brand name, model size, finish, and location of installation.

D. Store double action doors and accessories in unopened packages in protected dry area to prevent damage from environmental and construction operations.

E. Handle double action doors with care to prevent damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include the following:
   1. Chase Doors, (800) 543-4455.
   2. RubbAir Doors, (800) 966-7822

B. Section 01600 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.2 TRAFFIC DOORS

A. Model:
   1. Chase Doors: Durulite200 Series.
   2. RubbAir Doors: Quantum Series.

B. Color: Selected by Architect from manufacturer's standard colors.

C. Door Body:
   1. Surface Material: High-impact cross-linked polyethylene outer skin forming monolithic one-piece hollow shell which cannot separate. No add-on skin pieces, cutting that exposes foam core, or riveted assemblies shall be used. Maintain physical properties to -40 degrees F. Minimum 1/4-inch thickness with textured finish. The bottom leading and back edges shall be bull-nosed with a minimum 15/16 inch radius to prevent wear on edges. All other edges shall have 1/8-inch radius. View window openings and gasket keys shall be molded into door to prevent moisture penetration and have a secure area for placing window and gasket material.
   2. Insulated Core: High-density foamed-in-place urethane shall be used as the core insulation, U-factor shall not exceed .0686, R-factor shall be 14.58 or higher.

D. Hardware: The upper pivot shall consist of a V-cam with nylon sleeve, an anodized follower with nylon and steel roller capable of carrying a door weighing 200 pounds. Lift shall be 1-3/8 inches with gravity self-closing action. Door shall be adjustable back and forth and/or up and down. A nylon sleeve in a pillow block shall be used at the bottom.

E. Gaskets: All gasket materials shall be factory applied without the use of metal strips or fasteners of any type and shall include wings to prevent accumulation of dirt. Gaskets shall be on leading edge, back and bottom of each door panel.

F. Top and Hinge Seal Covers: Shall be made of block-reinforced nylon, with black anodized aluminum metal. Stainless steel screws shall be used for fastening to frame. Top and bottom hinge covers shall be field installed.

G. Viewing Area: View windows shall be 1/8-inch polycarbonate with abrasive resistant surface. Light will be sealed at the factory. The exposed surface of the light shall be recessed 1/8 inch from the face of the door. The anodized aluminum frame shall also be recessed with a center bar. The viewing area will be

the size indicated on the drawings. Maximum height from the finished floor to the bottom of the viewing area shall not exceed 48 inches.

H. Fasteners: All fasteners and washers, including jamb fasteners shall be made of stainless steel. There shall be no exposed fasteners or rivets on the other surface of the door body.

I. Black Spring Polyethylene Bumper: 36" high on both sides of doors.

J. Steel Door Frames: Specified in Section 05500.

2.3 SECURITY FEATURES

A. In addition to the items specified above, the following features shall be included in the door units:
   1. Lower hinge guard.
   2. Upper and lower cane bolts, minimum 5/8-inch round steel, 18 inches long from tip to elbow.
   3. For double doors: Chain hole with grommet - 1-5/8".
   4. For single doors: Slide bolt for pad lock.
   5. Dirt free retainer sleeves for each lower cane bolt, with a depth of at least 1”. Provide 2 sleeves per door panel; one for closed and locked position, and one for hold-open position.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify that openings are prepared with headers level, jambs plumb, floor level, without projections, and are correctly dimensioned to receive double action doors.

C. Report in writing to project manager prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the owner.

3.2 INSTALLATION

A. Install door unit assembly to manufacturer's published instructions and final shop drawings.

B. Fit and align door assembly level and plumb.

C. Use anchorage devices to securely fasten door assembly to door frame construction without distortion or imposed stresses.

3.3 ADJUSTING

A. Adjust door assembly to provide smooth operation from closed to full open position.

3.4 CLEANING

A. Section 01700 - Execution Requirements: Cleaning installed Work.

B. Remove protective material from pre-finished surfaces.

C. Remove labels and visible markings.

D. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Wipe surfaces clean.

END OF SECTION 08380

SECTION 08410 - ALUMINUM WINDOWS ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Aluminum entrance doors.
2. Aluminum storefronts with thermal break construction.
3. Aluminum windows (fixed and operable) with thermal break construction.
4. Vision glass and glass infill panels.
5. Door hardware for entrance doors.
6. Perimeter sealant.

B. Related Documents: The Contract Documents, as defined in Section 01110- Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:
1. Section 08460 - Automatic Entrance Doors.
2. Section 08710 - Door Hardware: Hardware for same, and coordination.
3. Section 08800 - Glazing: Requirements for glazing.

1.2 REFERENCES

A. Aluminum Association (AA):
1. AA-M12 C22 A41.

B. American Architectural Manufacturers Association (AAMA):
1. AAMA 605.2.
2. AAMA 701.2.
3. AAMA - Curtain Wall Manual #10

C. American Society for Testing and Materials (ASTM):
1. ASTM B209.
2. ASTM B221.
3. ASTM A36/A36M.
4. ASTM A386.

1.3 SYSTEM DESCRIPTION

A. Aluminum entrances and storefront system includes tubular aluminum sections with thermal break construction, shop fabricated, factory finished, glass and infill, related flashings, anchorage and attachment devices. System is to be glazed from the interior. **Provide thermal break construction.**

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
   1. Product Data:
      a. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
   2. Shop Drawings:
      a. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work and expansion and contraction joint location and details.
   3. Samples:
      a. Aluminum Extrusions: Submit one sample 12 inches (300 mm) long in size illustrating finished aluminum surface.
      b. Glazing: Submit one sample 12 x 12 inches (300 x 300 mm) in size illustrating finished aluminum glass units, and glazing materials.
   4. Assurance/Control Submittals:
      a. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
      b. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
   1. Special Warranty: Submit written special warranty with forms completed in United States Postal Service name and registered with manufacturer as specified in this Section.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing Products specified with minimum 5 years documented experience.
   2. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect Products.

B. Handle Products of this section in accordance with AAMA - Curtain Wall Manual #10.

C. Protect finished aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.7 PROJECT CONDITIONS OR SITE CONDITIONS

A. Jobsite Requirements:
   1. Install sealants and glazing only when temperature is 40 degrees F. or greater.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Energy Efficiency:
   1. Exterior framing system: **Provide frame with thermal break for exterior framing systems**; provide weather-stripping for doors in exterior frame.

1.9 WARRANTY

A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

B. Special Warranty:
   1. The manufacturer/installer shall warrant the product and installation to be free from defective material and workmanship for a period of two years after date of substantial completion, and shall replace or repair any defective component or system, in whole or part, as necessary to restore the product to its original intended state and integrity.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
   1. Kawneer Company, Incorporated, Atlanta, GA (770) 449-5555.
   2. Other acceptable manufacturers offering equivalent products.
      a. Amarlite Architectural Aluminum and Glass Co., Tamarac, FL (800) 691-5750.
      b. EFCO Corporation; Monett, MO. (800) 221-4169.
      c. Tubelite, Inc., Reed City, MI. (800) 846-2227.
      d. U.S. Aluminum Corporation, Waxahachie, TX. (800) 627-6440.
      e. Vistawall Architectural Products, Terrell, TX. (800) 869-4567.
   3. Section 01600 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.2 MATERIALS

A. Extruded Aluminum: ASTM B221.

B. Sheet Aluminum: ASTM B209.

C. Steel Sections: ASTM A36/A36M; shaped to suit mullion sections.

D. Fasteners: Stainless steel.

2.3 COMPONENTS

A. Framing System: Trifab 451T, by Kawneer, 2 x 4-1/2 inch (50mm x 113mm) nominal dimension, minimum wall thickness of 0.080 inches, extruded aluminum flush glazed framing system with thermal break construction.
   1. Operable window to include:
      a. Limiters, allowing 4 inch (10 cm) maximum opening at leading edge of window.
      b. Insect screen installed with security fasteners.
      c. Locking devices installed with security fasteners. Awning type and hopper type windows require two locking devices, one on each side of the window.

B. Framing System: 451T, by Kawneer Company, Inc. 2 x 4-1/2 inch (50mm x 113mm) nominal dimension, minimum wall thickness of 0.080 inches, extruded aluminum flush glazed framing system with thermal break construction.

C. Column Covers: 0.040 inch aluminum, by Kawneer Company, Inc. Finish to match that of storefront system.

D. Receptor Channel: Model No. 450-038 and 65-025, by Kawneer Company, Inc. Finish to match that of storefront system.

2.4 ENTRANCE DOORS

A. Doors: Series 350 swing door, medium stile, by Kawneer Company, Inc. Door sizes indicated on Drawings.
   1. Vertical Stile: 3-1/2 inch (88mm), single piece.
   2. Top Rail: 3-1/2 inch (88mm), single piece.
   3. Bottom Rail: 10 inch (250mm), single piece.
   4. Glazing: 1/4 inch (6mm) thick units per Section 08800, with standard bevel glass stops.

2.5 GLASS AND GLAZING MATERIALS

A. Glazing Materials: As specified in Section 08800.

2.6 SEALANT MATERIALS

A. Sealant and Backing Materials:
   1. Perimeter Sealant: Type as specified in Section 07900.
   2. Sealant used within system (Not Used for Glazing): Type as specified in Section 07900.

2.7 HARDWARE

A. Section 01310 - Coordination: Verification of hardware components specified in Section 08710.

B. Hinges: Door manufacturer's standard three pairs of butt hinges with non-removable pins. Finish: to match adjacent exposed aluminum surfaces.

C. Locking Devices (where noted in Section 08710): Adams Rite MS+1891 latch/lock with double cylinder operation. Finish: 628.
   1. Cylinders: See Section 08710.

D. Push/Pulls: Type CP-2 push and type CO-9 pull, by Kawneer Company, Inc. Finish: to match adjacent exposed aluminum surfaces.

F. Weatherstripping, for Exterior Doors only:
   1. Head and Jamb: Replaceable wool, polypropylene, or nylon wool pile with aluminum strip backing, recessed in frame; AAMA 701.2.
   2. Sill: Semi-rigid polymeric material on aluminum anodized to match door; EPDM sweep strip; 38-560 by Kawneer or similar by other named manufacturers.

G. Threshold: See Section 08710.

2.8 FINISHES

A. Exposed Aluminum Surfaces: Architectural Class I anodic coating, AA-M12 C22 A41, Kawneer Interpon Powder Coatings, Permadize Hardcoat Finish or Anodized (not clear), unless otherwise indicated on Drawings.

B. Maintain same color range on doors, frames and other components. Do not mix light and dark shades.

C. Concealed Steel Items: Galvanized in accordance with ASTM A386 to 2.0 oz/sq. ft.

D. Apply two coats of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing to the Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Coordinate attachment and seal of perimeter air and vapor barrier materials.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of mastic and secure.

J. Install hardware using templates provided. Refer to Section 08710 for installation requirements.

K. Install glass in accordance with Section 08800.

L. Install glazing from interior only. No exterior glazing permitted. No glazing removal permitted from exterior.

M. Install perimeter sealant, backing materials, and installation criteria in accordance with Section 07900.

N. Install automatic door operators and actuators in accordance with Section 08640.

3.3 ADJUSTING

A. Section 01700 - Contract Closeout: Adjusting installed work.

B. Adjust operating hardware [and sash] for smooth operation.

3.4 CLEANING

A. Section 01700 - Contract Closeout: Cleaning installed work.

B. Remove protective material from pre-finished aluminum surfaces.

C. Wash down exposed surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

D. Remove excess sealant by method acceptable to sealant manufacturer.

END OF SECTION 08410

SECTION 08520 - ALUMINUM WINDOWS

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 the work of this section.

1..2 SYSTEM DESCRIPTION:

A. Design Requirements: Comply with air infiltration, water penetration and structural performance requirements indicated in AAMA 101-85 for the type, grade and performance class of window units required.
   1. Design wind velocity at the project site is 70 mph, expos "C".
   2. **Provide thermal break construction.**

1..3 SUBMITTALS:

A. Shop Drawings: Submit shop drawings for each type of window including information not fully detailed in the manufacturer's standard product data and the following:
   1. Elevations of continuous work at 1/4" scale.
   2. Full size section details of every typical composite member.
   3. Anchors.
   4. Accessories.
   5. Glazing details.

1..4 QUALITY ASSURANCE:

A. Standards: Requirements for aluminum windows, terminology and standards of performance, and fabrication workmanship are those specified and recommended in AAMA 101-85 and applicable general recommendation published by AAMA and AA.

1..5 WARRANTY:

A. Project Warranty: Submit a written warranty, executed by the Contractor, Installer and aluminum window manufacturer, agreeing to repair or replace aluminum window units, which fail in materials or workmanship within the specified warranty period.
   1. Warranty period for aluminum windows is 3 years after the date of substantial completion.

PART 2 - PRODUCTS

1..1 MANUFACTURERS: Kawneer Company, Incorporated, Atlanta, GA (770) 449-5555, or other acceptable manufacturers offering equivalent products.

.

1..2 MATERIALS:

A. Aluminum Extrusions: Provide alloy and temper recommended by the window manufacturer for the strength, corrosion-resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength and not less than 0.062" thickness at any location for main frame and sash members.

B. Fasteners: Provide aluminum, non-magnetic stainless steel, epoxy adhesive, or other materials warranted by the manufacturer to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors and other components of window units.

1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125" thick, reinforce the interior with aluminum or non- magnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.
2. Exposed Fasteners: Except where unavoidable for application of hardware, do not use exposed fasteners. For application of hardware, use fasteners that match the finish of the member or hardware being fastened, as appropriate.

C. Sealant: For sealants required within fabricated window units, provide type recommended by the manufacturer for joint size and movement. Sealant shall remain permanently elastic, non-shrinking, and non-migrating. Comply with Division-7 "Joint Sealants" section of these specifications for selection and installation of sealants.

1..3 WINDOW GRADES AND PERFORMANCE CLASSIFICATION:

A. Heavy Commercial Windows: Provide window units complying with requirements of AAMA Grade and Performance Class HC40. **Provide thermal break construction.**

1..4 WINDOW TYPES:

A. Fixed windows are window units consisting of a glazed frame installed into one opening and are not operable.

1..5 FABRICATION:

A. General: Except to the extent that more specific or stringent requirements are indicated, provide manufacturer's standard fabrication that complies with indicated standards and that produces units that are re-glazable without dismantling sash framing. Include a complete system for assembly of components and anchorage of window units, and prepare sash for glazing except where pre-glazing at the factory is indicated.

B. Thermal-Break Construction: Fabricate aluminum window units with an integrally concealed low conductance thermal barrier, located between exterior materials and window members exposed on the interior, in a manner that eliminates direct metal-to-metal contact. Provide thermal-break construction, which has been in use for not less than 3 years, has been tested to demonstrate resistance to thermal conductance and condensation, and has been tested to show adequate strength and security of glass retention.

1. Provide hardware with low conductivity or non-metallic material for hardware bridging thermal breaks at frame or vent sash.

C. Glazing Stops: Provide screw-applied or snap-on glazing stops, coordinated with glass selection and glazing system indicated. Finish glazing stops to match window units.

1..6 FINISHES:

A. Primed-for-Paint Finish: Provide NAAMM AA M10C12C42Rlx finish, cleaned with inhibited chemicals, acid-chromate-fluoride-phosphate conversion coating, followed immediately with epoxy-resin based baked-on primer to form a dry film thickness of 2.0 mils.

1. Provide manufacturer finish to match storefront window/door systems or color as selected by Architect.

PART 3 - EXECUTION

1..7 INSTALLATION:

A. Comply with manufacturer's specifications and recommendations for installation of window units, hardware, and other components of the work.

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

C. Set sill members and other members in a bed of compound or with joint fillers or gaskets, as shown, to provide weathertight construction. Refer to the "Joint Sealer" sections of Division-7 for compounds, fillers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashings and other components of the work.

END OF SECTION 08520

SECTION 08710 - FINISH HARDWARE

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 DESCRIPTION OF WORK:

A. Types of finish hardware required include the following:
   1. Hinges
   2. Lock cylinders and keys
   3. Lock and latch sets
   4. Bolts
   5. Closers
   6. Door trim units
   7. Protection plates
   8. Weather-stripping for exterior doors
   9. Thresholds
   10. Peepholes (wide angle, two (2) per door)

B. Silencers included integral with hollow metal frames specified with doorframes elsewhere in Division 8.

1..3 QUALITY ASSURANCE:

A. 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.

   1- Approved Manufacturers
      a- McKinney Mfg. Co.
      b- Von Duprin Inc.
      c- Sargent
      d- Pemko
      e- Schlage
      f- Rockwood
      g- Ives
      h- Hager Companies

1..4 SUBMITTALS:

A. 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.

B. 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.

PART 2 - PRODUCTS

1..5 MATERIALS AND FABRICATION:

A. General:

1. 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.
2. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match 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.
3. 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.
4. Tools and Maintenance Instructions for Maintenance: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware.

1..6 HINGES, BUTTS AND PIVOTS:

A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template- produced units.

B. 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.

C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

1. Steel Hinges: Steel pins.
2. Exterior Doors: Non-removable pins and security studs.
3. Out-swing Corridor Doors: Non-removable pins and security studs.

1..7 LOCK CYLINDERS AND KEYING:

A. Review the keying system with the Owner and provide the type required (master, grandmaster or great-grandmaster), either new or integrated with Owner's existing system.

B. Equip locks with cylinders for interchangeable-core pin tumbler inserts. Furnish only temporary inserts for the construction period, and remove these when directed.

C. Equip locks with high security cylinders which comply with performance requirements for Grade 1 cylinders as listed in ANSI A 156.5 and which have been tested for pick and drill resistance requirements of UL 437 and are UL listed.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products, which may be incorporated in the work, include, but are not limited to, the following:

    a. Hardware Division, Emhart Industries, Inc.
    b. Medeco Security Locks, Inc.
    c. Sargent and Company, Div. Walter Kidde & Co.
    d. Schlage Lock Co.
    e. Hager Companies

D. Metals: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver.

E. Comply with Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.

1. Permanently inscribe each key with number or lock that identifies cylinder manufacturer key symbol, and notation "DO NOT DUPLICATE".

F. Key Material: Provide keys of nickel silver only.

G. Key Quantity: Furnish 3 change keys for each lock; 5 master keys for each master system; and 5 grandmaster keys for each grandmaster system.

1..8 LOCKS, LATCHES AND BOLTS:

A. 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.

B. 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.

1. Provide 1/2" minimum throw on other latch and deadlock bolts.

C. Flush Bolt Heads: Minimum of 1/2" 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.

1..9 PUSH/PULL UNITS:

A. Concealed Fasteners: Provide manufacturer's special concealed fastener system for installation; through-bolted for matched pairs, but not for single units.

1..10 CLOSERS AND DOOR CONTROL DEVICES:

A. 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.

B. Provide grey resilient parts for exposed bumpers.

1..11 WEATHERSTRIPPING:

A. General: Except as otherwise indicated, provide continuous weather-stripping at each edge of every exterior door leaf. Provide type, sizes and profiles shown or scheduled. Provide non-corrosive fasteners as recommended by manufacturer for application indicated.

B. Weather-stripping at Jambs and Heads:

1. Provide bumper-type resilient insert and metal retainer strips, surface-applied unless shown as mortised or semi-mortised, of following metal, finish and resilient bumper material:

a. Flexible, hollow neoprene bulb or loop insert, conforming to MIL R 6055, Class II, Grade 40.

1..12 HARDWARE FINISHES:

A. 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.

B. Provide finishes which match those established by BHMA or, if none established, match the Architect's sample.

C. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI A156.18 "Materials & Finishes Standard", including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

PART 3 - EXECUTION

1..1 INSTALLATION:

A. 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.

B. 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.

C. Set thresholds for exterior doors in full bed of butyl rubber or polyisobutylene mastic sealant.

PART 4 - HARDWARE GROUPS:

Group 1: **Automatic Sliding Doors:** Doors 01, 02 and 03.

Hardware supplier to supply replacement cores and threshold. All other hardware to be provided by door manufacturer.

Hardware supplier shall provide the following: Each sliding door leaf shall have a Schlage "Everest" Conventional, Interchangeable Core (IC) double-cylinder at the bottom of the door and a Schlage "Everest" Conventional, Interchangeable Core (IC) single cylinder with keyed function on the exterior side of the door and a thumb latch on the interior side of the door to lock the two sliding leafs together.

Group 2: NOT USED.

Group 3: NOT USED.

Group 4: Doors 08 and 09.

3 ea.	Hinge	TA2714 4.5 x 4.5	25D	McKinney Mfg. Co.
1 ea.	Passage	AL10S SAT 626 10-025	US26D	Schlage
1 ea.	Closer	1430-RUO	EN	Sargent
3 ea.	Silencer	608	Grey	Rockwood
1 ea.	Door stop	409	32D	Rockwood

Group 5: Doors 10 and 11.

3 ea.	Hinge	TA2714 4.5 x 4.5	26D	McKinney Mfg. Co.
1 ea.	Privacy	AL40S SAT 626 10-025	US26D	Schlage
1 ea.	Closer	1430-RUO	EN	Sargent
1 ea.	Kickplate	10 x 34	32D	Rockwood
1 ea.	Engraved H.C.Sign	BF687 or BF688	BF687	Rockwood
3 ea.	Silencer	608	Grey	Rockwood
1 ea.	Door stop	409	32D	Rockwood

Group 6: **Overhead Sectional Door:** Door 05.

Door hardware by door manufacturer.

Group 7: Doors 04 and 06.

3 ea.	Hinge	TA2314 NRP	26D	McKinney Mfg. Co.
1 ea.	Exit Device	99NL x 990NL-R-ALK-1609	US26	Von Duprin Inc.

(**Exit Device shall have a Schlage "Everest" Conventional, Interchangeable Core (IC) cylinder on the exterior side of the door.)**

1 ea.	Closer	351 P10	EN	Sargent
1 ea.	Sweep	315CN-36"	AL	Pemko
1 ea.	Weatherstrip	303AV-36 x 84	AL	Pemko
2 ea.	Peephole	U698		Ives (wide angle)
1 ea.	Threshold	171A 36"		

Group 8: **Impact Doors:** Door 07.

Door hardware by door manufacturer.

END OF SECTION 08710

SECTION 08711 - CONTROLLING HARDWARE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Sliding entry door unit and locking hardware.
2. Electrical connection.
3. Glass at entry door unit by others.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:
1. Section 08410 – Entrances and Storefronts: Frame for mounting automatic door operators.
2. Section 08800 – Glass and Glazing: Glass to be set in entry door unit.
3. Section 08710 – Finish Hardware: Cylinder locks.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements:
1. When the header is mounted between the jambs over the door, the door arm must be completely concealed in the top rail of the door.
2. For an uncluttered sight line, the header shall mount approximately 1/8" from the top rail of the door without the use of an intermediate strip between the header and the top rail of the door.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
1. Product Data: Data for each item of hardware, including description of function, materials, and finishes.
2. Shop Drawings:
   a. Indicate details of hardware mounting to traffic door and door frame.
   b. Indicate electrical requirements and location for connection to building electrical system.
   c. Sequence of operation description of automatic door operation.
3. Assurance/Control Submittals:
   a. Certificates:
      1) Manufacturer's certificate that Products meet or exceed specified requirements.
      2) Manufacture's certification of Installer as an "Approved Installer."
   b. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer: Company specializing in manufacturing Products specified with minimum 5 years documented experience.

2. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience certified by manufacturer as an "Approved Installer."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect Products.

1.6 WARRANTY

A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

B. Special Warranty:
1. **The manufacturer/installer shall warrant the product and installation to be free from defective material and workmanship for a period of <u>FIVE (5) YEARS</u> after date of substantial completion, and shall replace or repair any defective component or system, in whole or part, as necessary to restore the product to its original intended state and integrity. The contractor shall provide a written warranty complying with the above-referenced requirements, and the written warranty shall include the phone/fax numbers to contact in the event warranty work is required during the stated warranty period. The contractor shall update the contact information as necessary during the warranty period.**

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include the following:
1. Besam, Incorporated.
2. Door-O-Matic.
3. Door Dynamics.
4. Stanley Magic-Door.
5. Gyro Tech.
6. Keane Monroe Corporation.

B. Model:
1. Entry Door Operator: KEANE MONROE ULTRA-GLIDE (Sliding Doors).
2. Activating Device: BEA, Inc., DK-12 (Active Infrared Presence Detector).
3. Guide Rail: Curran Engineering Company, Inc., CE-920-HB (Stainless Steel Tubular Guide Rail). Provide complete with floor escutcheon plates.

C. Substitutions: Not Permitted.

2.2 AUTOMATIC OVERHEAD CONCEALED SYSTEM (@ Entry Doors)

A. KEANE MONROE ULTRA-GLIDE AUTOMATIC SLIDING DOORS.

B. Mode of operation: Sliding door shall slide on exterior of building. Sliding door shall be driven by an electro-mechanical operator with a micro-computer control system. The door will be pulled from closed to open and open to close position stopping the door in both directions by electrically reducing the voltage,

stalling door against mechanical stop. Opening, closing speeds and hold open time shall be adjustable. A reinforced timing belt shall be used to convert rotating motion from the operator sprocket into horizontal motion of the door.

C. Components:
1. Aluminum and Glass Doors
   a. Aluminum doors, sidelites, operator housing and frame. Finish shall match Aluminum Storefront System ("Kynar" type Fluorpolymer coating). Provide horizontal muntin bar to provide glass protection.
   b. Entrance systems shall have door panels attached to a door carrier hanger assembly by means of an adjustable support rod pivot assembly and corrosion resistant adjustable breakaway release latch holding panel in the closed position under normal automatic operation. The support rod pivot assembly allows the door panel to be broken outward at any point in the door's opening or closing cycle allowing for safe emergency egress in compliance with NFPA 101. The door panel in the breakout mode disconnects the power to the control circuit inhibiting automatic door operation. The control circuit shall be resettable by re-engaging the door panel with the door carrier hanger assembly. Breakaway pressure shall be field adjustable (5-50 lbs.) to meet local building code requirements but will be factory set at 50 lbs. maximum.
2. Door Support System
   a. Rollers – Support, Anti-riser and Guide. The door assembly shall ride on two 2-11/16" (68.3mm) dia. support rollers incorporating lubricated sealed ball bearings rated at 250 lbs. each. The door shall be held on the track by means of two 2-7/16" (62.2mm) anti-riser rollers. Lateral adjustment of the door assembly shall provide sealing at door edges. Door height shall be adjustable by ± 9/32" (7.1mm).
   b. Door Carrier Hanger Assembly, Breakaway Latch, Limiting Arm and Door Lock. Lock to accept Best core, provided by other Division – 8 section.
   c. Air Infiltration and Intrusion Protection Equipment.
3. Whisper Slide Power Operator
   a. Whisper slide power close operator with microcomputer control. The microprocessor control shall allow the opening speed, closing speed, back check speed and latch check speed each to be adjusted separately and independently from each other to meet specific site conditions. The doors shall be set to be held closed with the motor. The control system shall also be set up to provide a count of the number of operations of the doors for maintenance purposes. Adjustable opening and closing speeds shall be set in accordance with ANSI 156.10. All adjustments shall be specific and reproducible. Settings with rotary switches are not allowed.
   b. Acusensor (by Lanson Industries) Activation and Threshold Protection with two holding beams per unit shall be provided in addition to the standard threshold protection. Each holding beam shall consist of an emitter and a detector, facing each other transmitting a pulsed infrared light beam across the door opening. Interruptions of this beam are to cause the door to open and to stay open until the interruption has been cleared.
   c. Three-piece Operator Housing; Extrusion Main Housing, with End Caps. Finish to match aluminum storefront system ("Kynar").

2.3 ACTIVATING DEVICES (@ Entry Doors)

A. Infrared Presence Detector: Model DK-12 (detector), complete with LO-21 (lock out relay), SBK-111 (kit for sliding doors), and VG087-C (compact)

1. Model DK-12 "Active infrared Presence Detector". Active Infrared sensor driven by microprocessor. Lock out relay provided to communicate door position through signature analysis to DK-12, which recognizes 1) when door is open, and 2) when door is closed. Unit completely programmable by remote control. Adjustable self-adaptation time of 30 seconds to 25 minutes. Mounted on door header on safety side. 24V AC power.

2. Model LO-21 “Lock Out Relay”. The Lock Out Relay shall inhibit the DK-12 output during the closing cycle. The LO-21 shall also communicate the position of the door to the DK-12. 24 V AC, with 4 MHz frequency.

3. Model SBK-111 “Kit for Sliding Doors”. The SBK-111 shall operate on infrared technology and use a photo-cell system. The kit is also used with the DK-12 and LO-21 to provide safety and disable the LO-21 if the beams are broken, letting the safety transmission go to the controller, not allowing the door to reactivate. The kit shall consist of an emitter and a receiver.
4. Model VG087-C “The Compact”. Motion detectors shall operate only on the FCC approved K-Band (24.125 GHz). The unit shall be no larger than 3 ¾” x 5” x 2 ½” in dimension. The unit shall provide 2 detection patterns (wide and narrow). Unit shall be constructed of rigid ABS anti-break plastic. It shall be mounted at a height of 7’ to 10’ and relay hold time from 0.5 seconds to 10 seconds. The adjustable detection pattern range shall be easily adjusted without dismantling the unit. Unit shall have and operating temperature range of –30 degrees F to 131 degrees F. Unit shall be weather resistant with a weather protection cover

2..4 ELECTRIC INTERLOCK

A. Provide electrical interlock to prevent motor burnout in case lock remains engaged.

2..5 LOCK HARDWARE

A. Keyed Cylinders: **Hardware supplier shall provide the following: Each sliding door leaf shall have a Schlage “Everest” Conventional, Interchangeable Core (IC) double-cylinder at the bottom of the door and a Schlage “Everest” Conventional, Interchangeable Core (IC) single cylinder with keyed function on the exterior side of the door and a thumb latch on the interior side of the door to lock the two sliding leafs together.**

A. Armored Strike: Adams Rite MS 4002.

D. Bottom Rail Deadbolt: The sliding doors shall be fitted with a High Security Deadbolt Lock mounted in the bottom rail of each door leaf. For key and cylinder, see item “A” above.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing to Contracting Officer prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the United States Postal Service.

3.2 INSTALLATION

A. Install automatic door operating hardware on traffic doors in accordance with manufacturer's published instructions and approved shop drawings.

B. Connect operating hardware system to building electrical system.

3.3 CONSTRUCTION

A. Interface with Other Work:
   1. Coordinate location of electrical connection and power requirements with electrical installer.
   2. Coordinate, locations, reinforcing, and attachment requirements with traffic door installer.
   3. Coordinate attachment requirements to steel door frame with door frame installer.

3.4 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field testing and inspection.

B. Owners representative will inspect door operation.

END OF SECTION 08711

SECTION 08800 - GLASS AND GLAZING

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. Extent of glass and glazing work is indicated on drawings and schedules.

B. Types of work in this section include glass, glazing plastic and glazing for:

1. Window units.
2. Doors.
3. Security glass set in window units.
4. Restroom mirrors (if not covered by Division – 10).

1..3 SYSTEM DESCRIPTION:

A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading, without failure including loss or breakage of glass or glazing plastics, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass, glazing plastics and glazing materials and other defects in the work.

1. Normal thermal movement is defined as that resulting from an ambient temperature range of 120 deg. F (67 deg. C) and from a consequent temperature range within glass and glass framing members of 180 deg. F (100 deg. C).
2. Deterioration of insulating glass is defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.

1..4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions.

1..5 QUALITY ASSURANCE:

A. Security Glass Identification: Each unit of burglar resistant glazing shall be permanently identified by the manufacturer. The identification shall be etched or ceramic fired on the glass and be visible when the unit is glazed.

B. 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 other referenced standards.

C. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.

1. 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.

D. Fire Resistance Rated Wire Glass: Provide wire glass products that are identical to those tested per ASTM E 163 (UL 9) and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

E. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of inspecting and testing organization indicated below:

1. Insulating Glass Certification Council (IGCC).
2. Associated Laboratories, Inc. (ALI).

F. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass or glazing plastic indicated and composed of primary glass or glazing plastic obtained from a single source for each type and class required.

1..6 DELIVERY, STORAGE, AND HANDLING:

A. Protect glass, glazing plastic and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass or glazing plastic, and damage to glass, glazing plastic and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1. Where insulating glass units will be exposed to substantial altitude changes, avoid hermetic seal ruptures by complying with insulating glass fabricator's recommendations for venting and sealing.

1..7 PROJECT CONDITIONS:

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1. Install liquid sealants at ambient and substrate temperatures above 40 deg. F (4.4 deg. C).

1..8 WARRANTY:

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

B. Manufacturer's Special Project Warranty on Insulating Glass: Provide written warranty signed by manufacturer of insulating glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure or hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided the manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during the warranty period.

1. Warranty Period: Manufacturer's standard but not less than 10 years after date of substantial completion.

C. Manufacturer's Warranty Against Plastic Deterioration: Provide written warranty signed by manufacturer of glazing plastic agreeing to furnish (f.o.b. point of manufacture, freight allowed project site), within specified warranty period indicated below, replacements for glazing plastic sheets which yellow or change color noticeably, lose strength, lose impact or abrasion resistance, or deteriorate appreciably in other substantive ways related to intended applications. Warranty applies to glazing plastic sheets, which have been installed to comply with manufacturer's instructions, and have not been subjected to forces and environmental conditions including maintenance procedures, which are contrary to manufacturer's recommendations.

1. Warranty Period: Manufacturer's standard but not less than 3 years after date of substantial completion.

PART 2 - PRODUCTS

2..1 MANUFACTURERS:

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

1. Manufacturers of Clear, Tinted and Mirrored Float Glass:

a. AFG Industries, Inc.
b. Ford Glass Division.
c. Guardian Industries Corp.
d. LOF Glass, Inc.
e. PPG Industries, Inc.
f. Saint-Gobain/Euroglass.
g. Capitol Glass.

2. Manufacturers of Patterned Glass:

    a. AFG Industries, Inc.
    b. Guardian Industries Corp.
    c. Hordis Brothers, Inc.
    d. Saint-Gobain/Euroglass

3. Manufacturers of Wire Glass:

    a. AFG Industries, Inc.
    b. Guardian Industries Corp.
    c. Hordis Brothers, Inc.
    d. Pilkington Sales (North America) Limited.

4. Manufacturers of Heat-Treated Glass:

    a. AFG Industries, Inc.
    b. Cardinal IG.
    c. Environmental Glass Products.
    d. Falconer Glass Industries.
    e. Ford Glass Division.
    f. Guardian Industries Corp.
    g. Hordis Brothers, Inc.
    h. LOF Glass, Inc.
    i. PPG Industries, Inc.
    j. Saint-Gobain/Euroglass.
    k. Spectrum Glass Prod. Div., H. H. Robertson Co.
    l. Viracon, Inc.
    m. Capitol Glass.

5. Manufacturers of Insulating Glass:

    a. Advanced Coating Technology.
    b. AFG Industries, Inc.
    c. Cardinal IG.
    d. Environmental Glass Products.
    e. Falconer Glass Industries.
    f. Ford Glass Division.
    g. Guardian Industries Corp.
    h. Hordis Brothers, Inc.
    i. Independent Insulating Glass.
    j. PPG Industries, Inc.
    k. Spectrum Glass Prod. Div., H. H. Robertson Co.
    l. Viracon, Inc.
    m. Capitol Glass

6. Manufacturers of Polycarbonate Plastic Glazing:

    a. DSM Sheffield Plastics
    b. GE Plastics
    c. Viracon

2..2 GLASS AND GLAZING PLASTIC PRODUCTS, GENERAL:

A. 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.

B. 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.

C. Sizes: Fabricate glass and glazing plastics to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass and glazing plastics manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass or glazing plastics manufacturer for application indicated.

2..3 GLASS TYPES:

A. 1" thick “Low E” insulating glass: 1/4” tinted float glass exterior and 1/4” clear float glass interior with 1/2” air space.

ACT. 1" thick “Low E” insulating glass: 1/4” clear float tempered glass exterior and 1/4” clear float tempered glass interior with 1/2” air space.

BT. 1/4” thick clear float tempered glass.

P. 1/8" thick polycarbonate at impact doors and overhead doors (provided and installed by door manufacturer).

S. Security Glass “Low E”: 1" thick insulating glass: 1/4” tinted float glass exterior, and 5/16” security-laminated sheets of glass with inner-layer of .075 inch vinyl or polycarbonate at interior with 7/16” airspace between interior and exterior glass. Security glazing to meet UL 972 or ASTM F1233 Class Three.

SCT. Security Glass “Low E”: 1" thick insulating glass: 1/4” clear float tempered glass exterior, and 5/16” security-laminated sheets of glass with inner-layer of .075 inch vinyl or polycarbonate at interior with 7/16” airspace between interior and exterior glass.

ST. Security Glass “Low E”: 1" thick insulating glass: 1/4” tinted float tempered glass exterior, and 5/16” security-laminated sheets of glass with inner-layer of .075 inch vinyl or polycarbonate at interior with 7/16” airspace between interior and exterior glass.

2..4 GLAZING PLASTIC:

A. Polycarbonate Glazing Plastic: Provide polycarbonate sheets with a minimum flexural strength of 13,500 psi per ASTM D 790, at 240 deg. F (116 deg. C) allowable continuous service temperature, and Izod impact strength of 16 ft-lb. per in. per ASTM D 256; in sizes and thicknesses indicated and complying with the following requirements.
   1. Type: Solar grade uncoated sheet, UV stabilized, formulated with ultra-violet screen to resist yellowing. Abrasion-resistant sheet coated both sides, with abrasion resistance of 3% max. haze increase for 100 revolutions of 500g Taber abraser, ASTM D 1044.
   2. Color: Where indicated as "Clear" provide colorless transparent sheet with light transmittance of 84% per ASTM D 1003 for ¼" thick sheet.

2..5 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES:

A. General: Provide products of type indicated and complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.
3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, silicone sealant.
4. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.
5. Preformed Butyl-Polyisobutylene Glazing Tape.

B. Available Products: Subject to compliance with requirements, products, which may be incorporated in the work, include, but are not limited to, the following:

1. Performed Butyl-Polyisobutylene Glazing Tape:

a. PTI 606; Protective Treatments, Inc.
b. PTI 303; Protective Treatments, Inc.
c. Tremco Polyshim Tape; Tremco.
d. Tremco 440 Tape; Tremco.
e. SST 800 Tape; Tremco.
f. Chem-Tape 40; Woodmont Products, Inc.

2..6 MISCELLANEOUS GLAZING MATERIALS:

A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants and glazing plastic, 80 to 90 Shore A durometer hardness.

D. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.

E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.

F. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

PART 3 - EXECUTION

3..1 EXAMINATION:

A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3..2 PREPARATION:

A. Clean glazing channels and other framing members to receive glass or glazing plastics, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3..3 GLAZING, GENERAL:

A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.

B. Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass or glazing plastics, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.

C. Protect glass from edge damage during handling and installation; 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 with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

D. Protect plastic surfaces from abrasion and other damage during handling and installation by retaining manufacturer's protective covering, or by other protective methods recommended by glazing plastic manufacturer. Remove covering at border of each piece prior to glazing, remove remainder of covering immediately after installation where glazing plastic will be exposed to sunlight or other conditions where later removal will become difficult.

E. Apply primers to joint surfaces where required for adhesion of sealants, as determined by pre-construction sealant-substrate testing.

3..4 GLAZING:

A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6" from corner, unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.

B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.

D. Miter cut gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3..5 PROTECTION AND CLEANING:

A. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.

B. Protect glass and glazing plastics from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.

C. Examine glass and glazing plastic surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass or glazing plastic manufacturer.

D. Remove and replace glass or glazing plastic which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

E. Wash glass and glazing plastic on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Wash glass and glazing plastic by method recommended by glass manufacturer.

END OF SECTION 08800

DIVISION 9 - FINISHES

Section 09250	**Gypsum Drywall**
Section 09300	**Tile**
Section 09511	**Acoustical Panel Ceilings**
Section 09650	**Resilient Flooring**
Section 09680	**Carpet**
Section 09900	**Painting**
Section 09910	**Anti-graffiti Coating**

SECTION 09250 - GYPSUM DRYWALL

PART 1 - GENERAL

1..1 RELATED DOCUMENTS:

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

1..2 SUMMARY:

A. Extent of each type of gypsum drywall construction required is indicated on Drawings.

B. This Section includes the following types of gypsum board construction:

1. Steel framing members to receive gypsum board.
2. Gypsum board/sheathing screw-attached to steel framing and furring members.
3. Heavy gauge steel framing members to receive gypsum board.
4. Burglar bars set in wall openings for mechanical ducts.
5. Recycling of waste products and use of products with recycled content.

C. This Section includes refurbishing of existing walls inside the project limits of remodel projects.

1..3 DEFINITIONS:

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this section or other referenced standards.

1..4 SUBMITTALS:

A. Product data from manufacturers for each type of product specified. See General Provisions and Special Provisions.

1..5 QUALITY ASSURANCE:

A. Single Source Responsibility: Obtain each type of gypsum board/sheathing and related joint treatment materials from a single manufacturer.

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. Neatly stack gypsum boards flat on leveled supports off the ground under protective covering.

C. Handle gypsum/sheathing boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1..7 PROJECT CONDITIONS:

A. Environmental Conditions, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.

B. Minimum Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C). For adhesive attachment and finishing of gypsum board maintain not less than 50 deg F (10 deg C) for 48 hours prior to application and continuously thereafter until drying is complete.

C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials form drying too rapidly.

1..8 SEQUENCING AND SCHEDULING OF SHEATHING

A. Sequence installation of gypsum sheathing board with installation of exterior cladding to comply with requirements indicated below:

1. Do not leave gypsum sheathing board exposed to the weather after application for longer than one month.

2. Do not leave gypsum sheathing board exposed to weather after its application for more than one month or, if protected as indicated below, for more than 6 months:

a. Protect cutouts, corners and joints in the sheathing by filling them with a flexible sealant at the time sheathing is applied.
b. As an alternate to sealant application, cover exposed exterior surface of sheathing with building paper or air infiltration barrier. Anchor covering with metal lath security fastened through sheathing to framing. Apply covering immediately after sheathing is installed.

1..9 ENVIRONMENTAL REQUIREMENTS

A. Resource Management:
1. Recycled Content: Provide gypsum board products with paper backing manufactured from 100 percent post-consumer recycled paper and gypsum core containing minimum 10 percent recycled gypsum.
a. Soil amendment from recycled scrap gypsum: Coordinate with Section 02480 Landscaping and Irrigation Systems to identify requirements for gypsum soil amendment and to prepare scrap gypsum board for use as soil amendment.

PART 2 - PRODUCTS

2..1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

1. Steel Framing and Furring:

a. Bostwick Steel Framing Co.
b. Gold Bond Building Products Div., National Gypsum Co.
c. United States Gypsum Co.

2. Grid Suspension Systems:

a. Chicago Metallic Corp.
b. National Rolling Mills Co.
c. Donn (United States Gypsum Co.)

3. Gypsum Boards and Related Products:

a. Centex American Gypsum Co.
b. Gold Bond Building Products Div., National Gypsum Co.
c. United States Gypsum Co.

2..2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS:

A. General: Provide components which comply with ASTM C 754 for materials and sizes, unless otherwise indicated.

B. Concrete Inserts: Inserts designed for attachment to concrete forms and for embedment in concrete, fabricated from corrosion-resistant materials, with holes or loops for attachment of hanger wires and capability to sustain, without failure, a load equal to 3 times that imposed by ceiling construction, as determined from testing per ASTM E 488, conducted by an independent testing laboratory.

C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper. 8 gauge wire where required by UL design requirements.

D. Angle-Type Hangers: Angles with legs not less than 7/8 inch wide, formed from 0.0635 inch thick galvanized steel sheet complying with ASTM A 446, Coating Designation G90, with bolted connections and 5/16 inch diameter bolts. (@ exterior soffit systems.)

E. Channels: Cold-rolled steel, 0.0598 inch minimum thickness of base (uncoated) metal and 7/16 inch wide flanges, protected with rust-inhibitive paint, and as follows:

1. Carrying Channels: 1-1/2 inch deep, 475 lbs per 1000 ft., unless otherwise indicated.

F. Steel Studs for Furring Channels: ASTM C 645, with flange edges bent back 90 deg and doubled over to form 3/16 inch minimum lip (return), minimum thickness of base (uncoated) metal and minimum depth as follows:

1. Thickness: 0.0329 inch, unless otherwise indicated.
2. Depth: As indicated.

G. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, depth of 7/8 inch, and minimum thickness of base (uncoated) metal as follows:

1. Thickness: 0.0179 inch, unless otherwise indicated.

H. Grid Suspension System: ASTM C 645, manufacturer's standard grid suspension system composed of main beams and cross furring members which interlock to form a modular supporting network.

I. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

2..3 STEEL FRAMING FOR WALLS AND PARTITIONS:

A. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 deg and doubled over to form 3/16" minimum lip (return) and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1. Thickness: 20 gauge (0.0329") at walls typical unless otherwise indicated.
2. Thickness: 16 gauge (0.0625") at jambs and head of doors and openings wider than 3'-10".
3. Depth: 3-5/8 inches, where indicated.
4. Depth: ***6 inches unless otherwise indicated.***
5. Depth: 4 inches where indicated.
6. Depth: 2-1/2 inches where indicated.
7. Depth: 1-5/8 inches where indicated.
8. Depth: As indicated.

B. Furring Brackets: Serrated-arm type, adjustable, fabricated from corrosion-resistant steel sheet complying with ASTM C 645, minimum thickness of base (uncoated) metal of 0.0329 inch, designed for screw attachment to steel studs and steel rigid furring channels used for furring.

2..4 GYPSUM BOARD:

A. General: Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end joints.

1. Thickness: Provide gypsum board in thicknesses indicated, or if not otherwise indicated, in 5/8 inch thicknesses to comply with ASTM C 840 for application system and support spacing indicated.

B. Gypsum Wallboard: ASTM C 36, and as follows:

1. Type: Regular.
2. Edges: Tapered.
3. Thickness: 5/8 inch unless otherwise indicated.

C. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work where Type X gypsum wallboard is indicated, shall meet all UL design requirements and shall be pre-approved without exception:

1. "Gyprock Fireguard 'C' Gypsum Board"; Domtar Gypsum Co.
2. "Fire-Shield G"; Gold Bond Building Products Div., National Gypsum Co.
3. "SHEETROCK Brand FIRECODE 'C' Gypsum Panels"; United States Gypsum Co.

C. Gypsum Backing Board for Multi-Layer Applications: ASTM C 442 or, where backing board is not available from manufacturer, gypsum wallboard, ASTM C 36, and as follows:

1. Type: Regular, unless otherwise indicated.
2. Type: Type X for fire-resistance-rated assemblies.
3. Edges: Manufacturer's standard.
4. Thickness: 1/2 inch, where indicated.
5. Thickness: 5/8 inch where indicated.

E. Water-Resistant Gypsum Backing Board: ASTM C 630, for use in toilet rooms, and other moist areas, and as follows:

1. Type: Regular, unless otherwise indicated.
2. Type: Type X for fire-resistance-rated assemblies where indicated.
3. Thickness: 5/8 inch, unless otherwise indicated.
3. Thickness: 1/2 inch where indicated.

F. Cementitious Backing Board: For use in bath and shower areas, as a substrate for wall tile, and as follows:

1. Thickness: 5/8 inch, unless otherwise indicated.

G. Exterior Gypsum Ceiling Board: ASTM C 931, with manufacturer's standard edges, of type and thickness indicated below:

1. Type: Type X for fire-resistance rated assemblies.
2. Thickness: 5/8 inch, unless otherwise indicated.
3. Characteristics: Weather resistant.

H. Gypsum Sheathing Board with Water-Resistant Core: ASTM C 79, with manufacturer’s standard square edges, of type and thickness as indicated below:

1. Type: Type X
2. Thickness: ½” unless noted otherwise.

2..5 TRIM ACCESSORIES:

A. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints which comply with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal, or metal combined with paper, with metal complying with the following requirement:

a. Sheet steel zinc-coated by hot-dip process.
b. Sheet steel coated with zinc by electrolytic processes.

2. Edge trim shapes indicated below by reference to designations of Fig. 1 in ASTM C 1047:

   a. "LC" Bead, unless otherwise indicated.
   b. "LK" Bead with square nose for use with kerfed jambs.
   c. "L" Bead where indicated.
   d. "U" Bead where indicated.

3. One-Piece Control Joint: Formed with vee-shaped slot per Fig. 1 in ASTM C 1047, with slot opening covered with removable strip.

   a. Place vertical control joints at the corner of each door frame to extend 6" above the ceiling.
   b. Place vertical control joint at 30'-0" o.c. for wall longer than 30'-0". Submit layout to Project Manager for approval.

B. Metal Cornerbead and Edge Trim for Exterior Ceilings: Comply with the following requirements:

1. Edge trim complying with ASTM C 1047, formed from rolled zinc, shape "LC" Bead per Fig. 1, unless otherwise indicated

2..6 GYPSUM BOARD JOINT TREATMENT MATERIALS:

A. General: Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.

B. Joint Tape: Paper reinforcing tape, unless otherwise indicated.

C. Setting-Type Joint Compounds: Factory-prepackaged,

1. Where setting-type joint compounds are indicated for use as taping and topping compounds, use formulation for each which develops greatest bond strength and crack resistance and is compatible with other joint compounds applied over it.
2. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer for this purpose.

D. Drying-Type Joint Compounds: Factory-prepackaged vinyl-based products complying with the following requirements for formulation and intended use.

1. Ready-Mix Formulation: Factory-premixed product.
2. Taping compound formulated for embedding tape and for first coat over fasteners and flanges of corner beads and edge trim.
3. Topping compound formulated for fill (second) and finish (third) coats.

2..7 MISCELLANEOUS MATERIALS:

A. General: Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and the recommendations of the manufacturer of the gypsum board.

B. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum boards.

C. Gypsum Board Screws: ASTM C 1002.

D. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable sealant complying with requirement specified in Division-7 section "Joint Sealers."

D. Sound Attenuation Blankets: Unfaced mineral fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and as follows:

1. Mineral Fiber Type: Fibers manufactured from glass.

F. Fasteners for Gypsum Sheathing: Type S steel drill screws, 1" long, with corrosion-resistant finish in form of cadmium plating or proprietary coating, and as follows:

1. For attachment of sheathing to light gage steel framing of less than 0.033 of an inch in thickness, provide steel drill screws complying with ASTM C 1002.
2. For attachment of sheathing to steel framing from 0.033 to 0.112 of an inch in thickness, provide steel drill screws complying with ASTM C 954.

G. Sealant for Gypsum Sheathing: Solvent-release-curing joint sealant compatible with joint substrates formed by gypsum sheathing and other related materials and complying with requirements of Division 7 Section "Joint Sealers".

PART 3 - EXECUTION

3..1 EXAMINATION:

A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected. All unsatisfactory conditions shall be brought to the attention of the Project Manager in written form only.

3..2 PREPARATION:

A. Ceiling Anchorages: Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling anchors in a manner that will develop their full strength and at spacing required to support ceiling.

1. Furnish concrete, metal deck-concrete/metal deck inserts and other devices indicated, to other trades for installation well in advance of time needed for coordination with other construction.
2. Furnish concrete inserts and other devices indicated, to other trades for installation well in advance of time needed for coordination with other construction.
3. Before sprayed-on fireproofing is applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fireproofing. Where offset anchor plates are required, provide continuous units fastened to building structure not more than 24 inches o.c. and to ceiling runners (tower construction requirements).
4. After sprayed-on fireproofing has been applied, remove only as much fireproofing as needed to

complete installation of drywall construction. Protect fireproofing that remains from damage.

3..3 INSTALLATION OF STEEL FRAMING, GENERAL:

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar construction to comply with details indicated and with recommendations of gypsum board manufacturer, or if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.

C. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement.

1. Where edges of suspended ceilings abut building structure horizontally at ceiling perimeters or penetration of structural elements.
2. Where partition and wall framing abuts overhead structure.

a. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.

D. Do not bridge building expansion and control joints with steel framing or furring members; independently frame both sides of joints with framing or furring members.

3..4 INSTALLATION OF STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS:

A. Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to cast-in concrete inserts or other anchorage devices or fasteners as indicated.

1. Do not attach hangers to metal deck tabs.
2. Do not attach hangers to metal roof deck.

B. Do not connect or suspend steel framing from ducts, pipes or conduit.

C. Keep hangers and braces 2 inches clear of ducts, pipes and conduits.

D. Sway-brace suspended steel framing with hangers used for support.

E. Install suspended steel framing components in sizes and at spacings indicated but not less than that required by referenced steel framing installation standard.

1. Wire Hangers: 0.1620 inch diameter (8 gage), 4 ft. on center.
2. Carrying Channels (Main Runners): 1-1/2 inch, 4 ft. on center.
3. Rigid Furring Channels (Furring Members): 16 inches on center.

F. Installation Tolerances: Install steel framing components for suspended ceilings so that cross furring members or grid suspension members are level to within 1/8 inch in 12 ft. as measured both lengthwise on each member and transversely between parallel members.

G. Wire-tie or clip furring members to main runners and to other structural supports as required by industry standards.

H. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross furring members to each other and butt-cut to fit into wall track.

I. For exterior soffits provide cross-bracing and additional framing required to resist wind uplift.

3..5 INSTALLATION OF STEEL FRAMING FOR WALLS AND PARTITIONS:

A. Install runners (tracks) at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other construction.

1. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surface do not vary more than 1/8 inch from plane of faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

D. Install steel studs and furring in sizes and at spacings indicated but not less than that required by referenced steel framing installation standard.

1. For single layer construction: 16 inches on center, except as noted.

E. Install steel studs so that flanges point in the same direction and gypsum boards can be installed in the direction opposite to that of the flange.

F. Frame door openings to comply with details indicated, with GA-219 and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

G. Frame openings other than door openings to comply with details indicated, or if none indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

3..6 APPLICATION AND FINISHING OF GYPSUM BOARD, GENERAL:

A. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 840.

B. Install sound attenuation blankets where indicated, prior to gypsum board unless readily installed after

board has been installed.

C. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.

D. Install ceiling boards across framing in the manner which minimizes the number of end-butt joints, and which avoids end joints in the central area of each ceiling. Stagger end joints at least 24 inches.

E. Install wall/partition boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.

F. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.

G. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

H. Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.

I. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

J. Form control joints and expansion joints at locations indicated, with space between edges of boards, prepared to receive trim accessories.

K. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are braced internally.

1. Except where 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. area, and may be limited to not less than 75 percent of full coverage.
2. Fit gypsum board around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, cut gypsum board to fit profile of coffers and allow 1/4 to 1/2 inch wide joint for sealant.

L. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4 inch to 1/2 inch space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant.

M. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

N. Where gypsum board does <u>not</u> extend to metal deck above, stop gypsum board a minimum of six inches above finished ceiling.

3..7 METHODS OF GYPSUM BOARD APPLICATION:

A. Single-Layer Application: Install gypsum wallboard as follows:

1. On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.
2. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated, and provide sheet lengths which will minimize end joints.
3. On partitions/walls 8'-1" or less in height apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.

B. Wall Tile Base: Where drywall is base for thin-set ceramic tile and similar rigid applied wall finishes, install gypsum backing board.

1. In "dry" areas install gypsum backing board or wallboard with tapered edges taped and finished to produce a flat surface.
2. At showers, tubs and similar "wet" areas, install water-resistant gypsum backing board to comply with ASTM C 840 and recommendations of gypsum board manufacturer.
3. On ceilings apply base layer prior to application of base layer on walls/partitions; apply face layers in same sequence. Offset joints between layers at least 10 inches. Apply base layers at right angles to supports unless otherwise indicated.
4. On partitions/walls apply base layer and face layers vertically (parallel to framing) with joints of base layer over supports and face layer joints offset at least 10 inches with base layer joints.

C. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:

1. Fasten with screws.

D. Double-Layer Fastening Methods: Apply base layer of gypsum board and face layer to base layer as follows:

1. Fasten both base layers and face layers separately to supports with screws for ceiling application.
2. Fasten base layers with screws and face layer with adhesive and supplementary fasteners at wall application only.

E. Exterior Soffits and Ceilings: Apply exterior gypsum soffit board perpendicular to supports, with end joints staggered over supports. Install with 1/4 inch open space where boards abut other construction.

1. Fasten with cadmium-plated screws.

3..8 INSTALLATION OF DRYWALL TRIM ACCESSORIES:

A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.

B. Install corner beads at external corners.

C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-

exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where "U" bead (semi-finishing type) is indicated.

1. Install "LC" bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
2. Install "LK" bead where substrate is kerfed to receive long flange of trim.
3. Install "L" bead where edge trim can only be installed after gypsum board is installed.
4. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

D. Install U-bead where indicated, and where exterior gypsum board edges are not covered by applied moldings or indicated to receive edge trim with face flanges covered with joint compound.

E. Install control joints at locations indicated, or if not indicated, at spacings and locations required by referenced gypsum board application and finish standard, and approved by the Architect for visual effect.

F. Install H-molding in exterior gypsum drywall construction where control joints are indicated.

3..9 FINISHING OF DRYWALL:

A. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.

B. Taped metal edges where gypsum board meets dissimilar material typical.

C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

D. Finish interior gypsum wallboard by applying the following joint compounds in 3 coats (not including prefill of openings in base), and sand between coats and after last coat:

1. Embedding and First Coat: Setting-Type Joint Compound.
2. Fill (Second) Coat: Setting-type joint compound.
3. Finish (Third) Coat: Ready-mix drying-type all-purpose or topping compound.

E. Finish exterior gypsum soffit board by using setting-type joint compounds to prefill joints, embed tape, and to apply first, fill (second) and finish (third) coats; smooth each coat before joint compound hardens to minimize need for sanding; sand between coats and after finish coat.

1. Painting of exterior gypsum soffit board after finish coat has dried is specified in Division-9 Section “Painting”.

F. Water-Resistant Gypsum Backing Board Base for Ceramic Tile: Comply with ASTM C 840 and manufacturer’s recommendations for treatment of joints behind tile.

G. Partial Finishing: Omit third coat and sanding on concealed drywall construction which is indicated for drywall finishing.

3..10 REPAIRING/REFURBISHING WALLS DAMAGED BY DEMOLITION:

A. Existing walls will sustain damage due to the removal of existing cabinets, wall mounted display cases, etc. These areas shall be repaired with a skim-coat.

B. Execute skim-coat on damaged existing walls by applying the following joint compounds in 3 coats (not including prefill of badly damaged areas), and sand between coats and after last coat:

1. Fill (First) Skim-Coat: Setting-Type Joint Compound.
2. Fill (Second) Skim-Coat: Setting-type joint compound.
3. Finish (Third) Skim-Coat: Ready-mix drying-type all-purpose or topping compound.

3..11 INSTALLATION OF GYPSUM SHEATHING:

A. General: Except as otherwise indicated, comply with manufacturer's instructions, GA 252, and the following for the installation of gypsum sheathing.

1. Cut boards at penetrations, edges and other obstructions of the work; fit tight against abutting work, except provide 3/8 inch setback where non-loadbearing work abuts structural elements at head and jambs.
2. Coordinate installation of sheathing with installation of flashing and joint sealers so that these combined materials are installed in the sequence and manner which prevents exterior moisture from passing through completed exterior wall assembly to the interior.
3. Apply fasteners so that screw heads bear tightly against face of gypsum sheathing boards but do not cut into face paper.
4. Do not bridge building expansion joints with gypsum sheathing; cut and space edges to match spacing of structural support elements.

B. Horizontal Installation: Install 2-feet wide gypsum sheathing boards horizontally with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges and stagger end joints of adjacent boards not less than one stud spacing, two where possible. Screw-attached boards at perimeter and within field of board to each steel stud as follows:

1. Fasteners spaced approximately 8 inches o.c. and set back 3/8 inch minimum from edges and ends of boards.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through gypsum sheathing to studs immediately after installation of sheathing.

C. Vertical Installation: Install 4-feet wide gypsum sheathing boards vertically with vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjoining boards. Screw-attach boards at perimeter and within field of board to each steel stud as follows:

1. Fasteners spaced approximately 8 inches o.c. and set back 3/8 inch minimum from edges and ends of boards.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through gypsum sheathing to studs immediately after installation of sheathing.

3..12 REFURBISHING OF EXISTING WALLS (REMODEL PROJECTS):

A. Existing walls within the project limits shall be refurbished prior to painting.

B. Repair all holes, cracks, nicks, and blemishes. Install sections of new gypsum wall board to patch large areas of damage. Patch and sand smaller damaged areas with 3 coats of joint compound.

C. Visit site prior to submitting bid in order to assess extent of required work.

3..13 PROTECTION:

A. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction being without damage or deterioration at time of Substantial Completion.

3..14 SITE ENVIRONMENTAL PROCEDURES

A. Waste Management: As specified in Section 01150 Environmental Procedures and as follows:
   1. Scrap gypsum: Coordinate with Section 02480 Landscaping and Irrigation Systems to identify requirements for gypsum soil amendment and to prepare scrap gypsum board for use as soil amendment.

END OF SECTION 09250

SECTION 09300 - TILE

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:
   1. Unglazed paver tile.
   2. Unglazed wall tile.
   3. Slip sheet.

1..3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. 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.

.

1..4 EXTRA MATERIALS

A. 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.

   1. Tile and Trim Units: Furnish quantity of full-size units equal to 5 percent of amount installed, for each type, composition, color, pattern, and size.

PART 2 - PRODUCTS

1..1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

   1. Unglazed Paver Tile (thickset application):

      a. Contempo Tile Corp., “Magma Ocre”, 18” x 18”, 12” x 12”, pinwheel or herringbone pattern.

2. 12” x 12” Unglazed Wall Tile (thinset application):

    a. Contempo Tile Corp., “Magma Ocre”.

3. Dry-Set Mortars and Grouts:

    a. American Olean Tile Co., Inc.
    b. Laticrete International Inc.
    c. Mapei Corp.
    d. Summitville Tiles, Inc.

4. Slip Sheet:

    a. Salinas Valley Wax Paper Co., Inc., Salinas, CA 831-424-2747
    b. Contempo Tile, Salt Lake City, UT 801-262-1717

1..2 PRODUCTS, GENERAL

A. 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.

B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

    1. Provide selections made by Architect from manufacturer's full range of standard colors, textures, and patterns for products of type indicated.
    2. Provide tile trim and accessories that match color and finish of adjoining flat tile.

1..3 TILE PRODUCTS

A. Unglazed Paver Tile: Provide flat tile complying with the following requirements:

    1. Composition: Porcelain.
    2. Nominal Facial Dimensions: 12 inches by 12 inches and 18 inches by 18 inches.
        a. Natural Finish.
    3. Nominal Thickness: 5/16".
    4. Face: Plain with square or cushion edges.

B. Glazed Wall Tile: Provide flat tile complying with the following requirements:

    1. Nominal Facial Dimensions: 12 inches by 12 inches.
        a. Group 1 Colors.
    2. Nominal Thickness: 5/16 inch.
    3. Face: Plain with modified square edge or cushion edge.
    4. Mounting: Factory back-mounted.

C. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile.

1..4 SETTING MATERIALS

A. Portland Cement Mortar Installation Materials: Provide materials complying with ANSI A108.1 and as specified below.

B. Latex-Portland Cement Mortar: ANSI A118.4, composition as follows:

1. Latex additive (water emulsion) of type described below, serving as replacement for part or all of gauging water, combined at job site with prepackaged dry mortar mix supplied or specified by latex additive manufacturer.

a. Latex Type: Manufacturer's standard.

1..5 GROUTING MATERIALS

A. Latex-Portland Cement Grout: ANSI A118.6, color as indicated, composition as follows:

1. Latex additive (water emulsion) serving as replacement for part or all of gauging water, added at job site with dry grout mixture, with latex and dry grout mix.

1..6 SLIP SHEET

A. Asphalt laminated paper: Grade “B”, 16-hour water resistance. Must meet Federal Spec. 00-8790A,
Type I, Grade B, Style 1A and UBC Standard 14-1. Description: two (2) sheets of 30 Kraft paper Laminated with 30 lbs. per ream of high melt point asphalt, low sulphur and virtually odor free.

PART 3 - EXECUTION

1..1 EXAMINATION

1..2 INSTALLATION, GENERAL

A. 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.

B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated.

C. 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.

D. Grout tile to comply with the requirements of the following installation standards:

1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

E. Slip sheet: Install Ratan asphalt laminated Kraft paper, per manufacturers and trade recommendations.

1..3 FLOOR INSTALLATION METHODS

1. Latex Portland Cement Mortar: ANSI A118.5.
   a. Concrete Subfloors, Interior: TCA F112-98.

1..4 WALL TILE INSTALLATION METHODS

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

1..5 EXTRA STOCK

A. At the completion of installation, deliver to the owner one (1) carton of tiles of each type, size and color installed.

END OF SECTION 09300

SECTION 09511 - ACOUSTICAL PANEL CEILINGS

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 acoustical panel ceilings.

1..3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual acoustical units or sections of units showing full range of colors, textures, and patterns available for each type of unit indicated.

1..4 EXTRA MATERIALS

A. 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.

1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 3.0 percent of each panel type, pattern and color installed.

PART 2 - PRODUCTS

1..1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products, which may be incorporated in the Work, include, but are not limited to, the following:

1. Mineral Base Panels - Water Felted, with Painted Finish and Perforated and Fissured Pattern, Non-Fire-Resistance Rated:

a. "Minaboard Cortega," Armstrong World Industries, Inc.
b. "Hytone Baroque," Celotex Corp.
c. "Auratone Natural Fissured II," USG Interiors, Inc.

1..2 ACOUSTICAL CEILING UNITS, GENERAL

A. Standard for Acoustical Ceiling Units: Provide manufacturers' standard units of configuration indicated that comply with ASTM E 1264 classifications as designated by reference to types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1..3 MINERAL-BASE PANELS - WATER FELTED

A. Type, Form, and Finish: Provide type III, Form 2 units per ASTM E 1264 with painted finish that comply with pattern and other requirements indicated.

B. Perforated, Fissured, and Scored Pattern: Units fitting ASTM E 1264 pattern designations C, D, and K, with other panel characteristics as follows:

1. Configuration: Refer to reflected ceiling plan.
2. Color/Light Reflectance Coefficient: White/LR 0.70.
3. Noise Reduction Coefficient: NRC 0.55.
4. Ceiling Sound Transmission Class: CSTC 35.
5. Edge Detail: Reveal sized to fit flange of exposed grid members.
6. Size: 24 inches by 48 inches by 5/8 inch.

PART 3 - EXECUTION

1..4 INSTALLATION

A. General: Install acoustical ceiling systems to comply with installation standard referenced below, per manufacturer's instructions and CISCA "Ceiling Systems Handbook."
   1. Standard for Installation of Ceiling Suspension Systems: Comply with ASTM C 636.

B. 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.
   1. Install hold-down clips in areas indicated and in areas where required by governing regulations or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.

END OF SECTION 09511

SECTION 09650 - RESILIENT FLOORING

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 DESCRIPTION OF WORK:

A. Extent of resilient flooring and accessories is shown on drawings.
   1. Vinyl composition tile
   2. Rubber wall base
   3. Rubber stair treads and risers

1..3 SUBMITTALS:

A. 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.

   1. Full-size tile, tread and base samples.

PART 2 - PRODUCTS

1..1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

   1. Manufacturers of Vinyl Composition Tile:
      a. Armstrong.
      b. Tarkett Inc.
      c. The Mohawk Group

   2. Manufacturers of Rubber Wall Base:
      a. Johnsonite, Inc., Chagrin Falls, OH 44023

1..2 RESILIENT FLOORING COLORS AND PATTERNS:

A. Provide colors and patterns as selected by Architect from manufacturer's standards.

1..3 TILE FLOORING:

A. Vinyl Composition Tile: FS SS-T-312, Type IV; 12" x 12" unless otherwise indicated, and as follows:

   1. Composition 1 - asbestos-free.

2. Gage: 1/8".

1..4 ACCESSORIES:

A. Rubber Wall Base: Provide base complying with ASTM F-1861, Type TP, Group 1 (solid), with matching end stops and preformed or molded corner units, and as follows:

1. Height: 4", coved toe profile, including inside and outside corners with 4” returns.
2. Thickness: .125” thickness.
3. Hardness: ASTM D 2240 Rubber - 85 Shore A.
4. Meets or exceeds the performance requirements of resistance to heat/light aging, chemicals, and dimensional stability when tested to the methods, as described, in ASTM F-1861.
5. Adhesives: Porous Surfaces, Johnsonite 960 Acrylic Cove Base Adhesive; Non-porous surfaces, Johnsonite 945 Contact Bond Adhesive.
6. Warranty: Limited 1-year warranty by manufacturer.
7. Style: Standard top-set cove at V.C.T. and sealed concrete flooring.
8. Finish: Matte.
9. Color: As selected by Architect from manufacturer’s full range of colors.

B. Resilient Edge Strips: 1/8" thick, homogeneous rubber composition, tapered or bullnose edge, color to match flooring, or as selected by Architect from standard colors available; not less than 1" wide.

C. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.

D. Resilient Stair Treads: Provide treads where shown, consisting of single-piece units for width of stair treads, or equal-length units if tread width exceeds available manufactured lengths.
1. Provide rubber stair tread units, complying with FS RR-T-650, Type A, sanded backs, style as indicated.
a. Provide rubber stair treads with raised profile surface and color change at top end bottom riser.

E. Resilient Risers: Provide single-piece riser for height and width of stair risers or equal-sized units if riser width exceeds available manufactured lengths.

1. Provide rubber risers for stairs.

PART 3 - EXECUTION

1..5 PREPARATION:

A. Prepare subfloor surfaces as follows:

1. Use leveling and patching compounds as recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors.
2. Remove coatings from subfloor surfaces that would prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives, paint, oils, waxes and sealers.

B. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

1..6 INSTALLATION, GENERAL:

A. 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.

B. Tightly cement resilient flooring to subbase 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.

1..7 INSTALLATION OF ACCESSORIES:

A. Apply rubber 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.

1..8 EXTRA STOCK:

A. 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.

1. Tile Flooring and Treads: Furnish not less than 5% extra stock material and adhesive for each type, color, pattern and size installed.
2. Rubber Wall Base: Furnish not less than 5% extra stock material for each type, color, style and size installed.

END OF SECTION 09650

SECTION 09680 - SHAW KINETIC CARPET TILE

State of Utah Carpet Contract MA 1863
Wall 2 Wall Commercial Floor Coverings, Contact: Brian Bisk, 801-478-0990 Ext. 101.

1.1 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Accessories.

1.2 REFERENCES

A. American Association of Textile Chemists and Colorists (AATCC):
1. AATCC 16-[98], Test Method for Colorfastness to Light.
2. AATCC 23-[99], Test Method for Colorfastness to Burnt Gas Fumes.
3. AATCC 107-[97], Test Method for Colorfastness to Water.
4. AATCC 109-[97], Test Method for Colorfastness to Ozone in The Atmosphere Under Low Humidity.
5. AATCC 117-[99], Test Method for Colorfastness to Heat: Dry (Excluding Pressing).
6. AATCC 134-[96], Test Method for Electrostatic Propensity of Carpets.
7. AATCC 165-[93], Test Method for Colorfastness to Crocking: Carpets - AATCC Crockmeter Method.
8. AATCC 174-[98], Test Method for Antimicrobial Activity Assessment of Carpets.
9. AATCC 175-[98], Test Methods for Stain Resistance: Pile Floor Coverings.

B. American Society for Testing and Materials (ASTM)
1. ASTM D418 - Methods of Testing Pile Yarn Floor Covering Construction.
2. ASTM D5116 - Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.
3. ASTM E648 - Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
4. ASTM E662 - Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

C. Carpet & Rug Institute (CRI):
1. CRI Indoor Air Quality Testing and Labeling Program.

D. U.S. Department of Housing and Urban Development (HUD):
1. HUD UM 44D-[93], HUD Building Product Standards and Certification Program for Carpet.

1.3 PERFORMANCE REQUIREMENTS

A. Comply with the following Performance Requirements:
1. Carpet Flammability:
   a. Radiant Panel Test: (ASTM E648): > .45 watts/sq. cm; Class I
   b. Smoke Density: (ASTM E662): < 450 Flaming Mode
2. Dimensional Stability: (Aachen Method DIN 54318) < 0.1% change
3. Static Generation at 70 degrees F: (AATCC 134 w/ neolite): <2.5 kV at 20% R.H.
4. Lightfastness: (AATCC 16E): 4.0 after 60 hours
5. Crocking: (AATCC 165): 4.0 wet, dry

6. Cold Water Bleed: (AATCC 107): 4.0
7. Sublimation: (AATCC 117): 4.0
8. Gas Fade: (AATCC 23): 4.0
9. Ozone Fade: (AATCC 109): 4.0
10. Soil/Stain Protection: (AATCC 175-1991): > 8.0 on the Red 40 Stain Scale
11. CRI Green Label Air Quality Certification: Passes

1.4 SUBMITTALS

A. Manufacturer's Data: Submit two (2) copies of manufacturer's specifications and installation instructions for carpet tile and related items specified. Manufacture shall also submit a plan for recycling the specified carpet and related items at the end of the carpet's useful life.

B. Fiber Verification: Submit certification from the fiber producer verifying use of the branded fiber in the submitted carpet product. Certification should include the % recycled content by weight for fibers, describing the source of this recycled content. If virgin nylon is used, the manufacturer shall include, as part of the fiber certification, the precise method that will be used to recapture the nylon at the end of the useful life of the carpet. State whether it will be returned to nylon carpet, yarn production, downcycled to an end use other than carpet yarn used for waste-to-energy conservation, or disposed of in a specified manner.

C. Shop Drawings: For carpeted areas submit shop drawings showing installation of carpeting, seam diagram, pattern direction, necessary installation accessories, and provisions for work of other trades. Show location of different patterns or styles of carpet. Also, show locations of any threshold conditions. If mixed fiber types are used on the areas shown, the fiber type must be clearly identified to facilitate future recycling.
   1. The contractor will supply reproducible prints on request, to facilitate shop drawing preparation.

D. Samples: Submit standard-size carpet samples of each type of carpet, in each specified pattern, color, and construction.
   1. Any alternates to specified products must be submitted for approval by a representative of the end user or architect/design firm at least ten (10) working days prior to bid or proposal.
   2. Final Sample Submittal
      Submit two (2) sets of samples for each carpet type.
   3. No carpet shipments are permitted until acceptance of final samples is given by representative of the end user or architect/design firm, certifying that samples are the approved color, pattern, and texture. No carpet shipments are permitted until the fiber certifications and recycling plans are approved by the end user or architect/design firm.
   4. Custom Color Only
      High-quality color samples shall be signed by a representative of the end user or architect/design firm, certifying that samples are the approved color, pattern, and texture.
   5. Samples submitted are assumed to the manufacturer's best obtainable match to the carpet described under Materials Section.

E. Indoor Air Quality Test Reports: Submit for specified products, indicating that the test results do not exceed the stated emission criteria of the CRI Indoor Air Quality Carpet Testing Program.

F. Recycling Instructions: Submit written certification of environmental compliance describing all aspects of recycling programs for carpet uplifted for replacement and for carpet to be installed, including compliance by the carpet manufacturer and carpet trade contractor.

A representative from the carpet manufacturer shall meet with the contractor in the presence of a representative of the end user and architect/design firm to review the recommended procedures, prior to occupancy of the finished spaces.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Include maintenance procedures, recommended cleaning and stain-removal materials, and recommended cleaning schedule. Include product data and Material Safety Data Sheets (MSDS) for cleaning and stain-removal materials.

B. When the installation is complete, the manufacturer shall deliver (1) a certificate of recycling, which describes the method by which the uplifted carpet was recycled; and (2) a warranty of recycling, which specifies the method by which the new carpet tile will be recycled at the end of its useful life.

1.6 QUALITY ASSURANCE

A. Single Source Responsibility: Provide products from a single manufacturer for each recyclable carpet type specified.

B. Sustainability Commitment: Carpet manufacturer must practice environmental responsibility through programs of raw material reduction, recycling, reuse, and energy and natural resource conservation.

1.7 QUALIFACTIONS

A. Manufacturer: Company specializing in manufacturing specified recyclable carpet tile with minimum three (3) years documented experience.

B. Installer: Company specializing in installing carpet tile with minimum five (5) years documented experience, approved by the manufacturer and participation in manufacturer's environmental program including responsible carpet removal, recycling, and installation.

1.8 PRE-INSTALLATION MEETINGS

A. Convene one (1) week prior to commencing work of this section.

B. Require attendance of installer, contractor, architect and other parties directly affecting the work of this section.

C. Review carpet [recycling procedures outlined in manufacturer's environmental program and] installation procedures and coordination with work of other sections.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver carpet tile in sealed protective cartons and accessories in sealed containers. Bind carpet materials with secure protective wrapping.

B. Waste Reduction: Use bulk packaging of carpet tile when delivery is made to job site for immediate installation to reduce waste. Alternative, environmentally friendly packaging must protect carpet tile as securely as normal packaging.

C. Store products in an enclosed and dry area protected from damage and soiling.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not install carpet tile until areas have been fully enclosed and environmental conditions have reached the levels indicated during occupancy.

B. Maintain ambient temperature and humidity conditions during and after installation of carpet tile at levels indicated during occupancy.

C. Allow carpet to reach room temperature or minimum temperature recommended by manufacturer before beginning installation.

1.11 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on drawings.

1.12 SEQUENCING

A. Sequence installation so as to minimize possibility of damage and soiling of carpet tile.

B. Do not commence installation until painting and finishing work are complete, and ceiling and overhead work have been tested, approved, and completed.

C. Remove and replace existing carpet in accordance with a pre-approved reuse and/or recycling plan.

1.13 WARRANTY

A. Provide carpet manufacturer's five (5) year warranty against defects in materials.

B. Warranty: Include coverage for:
1. Surface Wear: Not more than 10 percent by weight throughout life of product.
2. Static: Maintain static generation at less than 2.3 kV at 70 degrees F., and 20 percent R.H. throughout life of product.
3. No delamination throughout life of product.
4. No edge ravel throughout life of product.
5. Provide tuft bind consistent with industry standard.
6. No dimensional instability (i.e. shrinkage, curling and doming), which adversely affects ability of carpet tile to lie flat throughout life of product.
7. Environmental Warranty for Recycling: Used carpet tile will be recycled at end of its useful life.
8. Also provide carpet installer's one (1) year warranty against defects in installation.
9. Lifetime Commercial Limited Warranty: Warranty that owner with be completely satisfied with performance of carpet when installed in accordance with manufacturer's installation instructions and when maintained in accordance with current carpet care recommendations, and when such maintenance continues throughout duration of

warranty period when owned and operated by original Owner. Also warrant that Owner will be satisfied with recycling of carpet at end of its useful life as outlined in manufacturer's environmental warranty.

1.14 EXTRA MATERIALS

A. Provide three (3) percent overage of calculated yardage for each type of carpet (include carpet needed for complete installation plus waste and usable scraps in calculated yardage). Recycle waste, unusable scrap, and carpet tile damaged during installation through manufacturer's environmental program.

B. Deliver specified overrun and usable pieces of carpet to owner's designated storage space, properly packaged (boxed) and identified. Redirect small pieces of waste carpet to be appropriately recycled.

END OF SECTION 09680

SECTION 09900 - PAINTING

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 surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections. **The painting of all new work designated to be painted shall consist of one coat of primer and two finish coats (three coats total) in accordance with this section, unless noted otherwise.**

B. 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 will select from standard colors or finishes available.

C. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

1..3 DEFINITIONS

A. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1..4 SUBMITTALS

A. Samples for initial color selection in the form of manufacturer's color charts.
1. After color selection, the Architect will furnish color chips for surfaces to be coated.

1..5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

B. Material Quality: Provide the manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude equal products of other manufacturers.
2. Federal Specifications establish a minimum quality level for paint materials, except where other product identification is used. Provide written certification from the manufacturer that materials provided meet or exceed these criteria.

1..6 DELIVERY, STORAGE, AND HANDLING

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

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Federal Specification number, if applicable.
4. Manufacturer's stock number and date of manufacture.
5. Contents by volume, for pigment and vehicle constituents.
6. Thinning instructions.
7. Application instructions.
8. Color name and number.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1..7 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).

C. Do not apply paint in snow, 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.

1. 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.

PART 2 - PRODUCTS

1..1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:

1. Devoe and Raynolds Co. (Devoe).
2. The Glidden Company (Glidden).
3. Benjamin Moore and Co. (Moore).
4. PPG Industries, Pittsburgh Paints (Pittsburgh).
5. Pratt and Lambert (P & L).
6. The Sherwin-Williams Company (S-W).

1..2 PRIMERS

A. Latex-Based Interior White Primer: Latex-based primer coating used on interior gypsum drywall under a flat latex paint or an alkyd semi-gloss enamel.

1. Devoe: 50801Wonder-Tones Latex Primer and Sealer.
2. Glidden: 5019 PVA Primer.
3. Moore: Moore's Latex Quick-Dry Prime Seal #201.
4. Pittsburgh: 6-2 Quick-Dry Latex Primer Sealer.
5. P & L: Latex Wall Primer Z30001.
6. S-W: Pro-Mar 200 Latex Wall Primer B28W200.
7. ICI: Dulux Prep&Prime Hi Hide Wall water-based primer sealer.

B. Synthetic, Rust-Inhibiting Primer: Quick-drying, rust-inhibiting primer for priming ferrous metal on the exterior under full-gloss and flat alkyd enamel and on the interior under flat latex paint or odorless alkyd semi-gloss or alkyd gloss enamels:

1. Devoe: 14920 Bar-Ox Quick Dry Metal Primer, Red.
2. Glidden: 5210 Glid-Guard Universal Fast-Dry Metal Primer.
3. Moore: Ironclad Retardo Rust-Inhibitive Paint #163.
4. Pittsburgh: 6-208 Red Inhibitive Metal Primer.
5. P & L: Effecto Rust-Inhibiting Primer.
6. S-W: Kem Kromik Metal Primer B50N2/B50W1.

C. Alkyd-Type Zinc Chromate Primer: Primers used for priming ferrous metals on the exterior under high-gloss alkyd enamels.

1. Devoe: 41839 Bar-Ox Zinc Chromate Primer.
2. Glidden: 5205 Glid-Guard Tank & Structural Primer.
3. Pittsburgh: 6-204 Zinc Chromate Primer.
4. P & L: Tech-Gard Zinc Chromate Primer E154.
5. S-W: Zinc Chromate Primer B50Y1.

D. Galvanized Metal Primer: Primer used to prime interior and exterior zinc-coated (galvanized) metal surfaces:

1. Devoe: 13201 Mirrolac Galvanized Metal Primer.
2. Glidden: 5229 Glid-Guard All-Purpose Metal Primer.
3. Moore: Ironclad Galvanized Metal Latex Primer #155.
4. Pittsburgh: 6-215/216 Speedhide Galvanized Steel Primer.
5. S-W: Galvite B50W3.

1..3 EXTERIOR FINISH PAINT MATERIAL

A. Alkyd Gloss Enamel: Weather-resistant high-gloss enamel for use over primed ferrous metal surfaces:

1. Devoe: 70XX Mirrolac Interior/Exterior Alkyd Gloss Enamel.
2. Glidden: 4500 Glid-Guard Industrial Enamel.
3. Moore: Impervo High-Gloss Enamel #133.
4. Pittsburgh: 54 Line Quick-Dry Enamel.
5. P & L: Effecto Enamel.
6. S-W: Industrial Enamel B-54 Series.

B. Alkyd Gloss Enamel: Weather-resistant high-gloss enamel for use over primed, zinc-coated (galvanized) metal surfaces and aluminum:

1. Devoe: 70XX Mirrolac Interior/Exterior Alkyd Gloss Enamel.
2. Glidden: 4500-Line Glid-Guard Industrial Enamel.
3. Moore: Impervo High-Gloss Enamel #133.
4. Pittsburgh: 54 Line Quick-Dry Enamel.
5. P & L: Effecto Enamel.
6. S-W: Metalastic II Enamel B-53 Series.

1..4 INTERIOR FINISH PAINT MATERIAL

A. Exterior alkyd gloss enamel for use over a primer and undercoat on interior wood, and hardboard and ferrous and zinc-coated metal surfaces:

1. Devoe: 70XX Mirrolac Interior/Exterior Alkyd Gloss Enamel.
2. Glidden: 4500 Glid-Guard Industrial Enamel.
3. Moore: Impervo High-Gloss Enamel #133.
4. Pittsburgh: 54 Line Quick-Dry Enamel.
5. P & L: Effecto Enamel.
6. S-W: Industrial Enamel B-54 Series.

B. Interior latex eggshell for use over a primer and undercoat on gypsumboard surfaces:

1. ICI: Dulux Pro Premium Latex Interior Wall & Trim Finish
2. Glidden: Glidden Color Interior Latex Eggshell.
3. Benjamin Moore: Aura Eggshell Waterborne Interior Paint 524
4: Pittsburgh: Speedhide Interior Latex eggshell.
5. P & L: Pro-Hide Gold Interior Latex eggshell.
6. Sherwin-Williams: Builders Solution Interior Latex Eg-shel.

PART 3 - EXECUTION

1..1 EXAMINATION

A. 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.

1..2 PREPARATION

A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Surface Preparation: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing of problems anticipated with using the specified finish-coat material with substrates primed by others.
2. Ferrous Metals: Clean non-galvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.

a. Blast steel surfaces clean as recommended by the paint system manufacturer and in accordance with requirements of SSPC specification SSPC-SP 10.
b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

3. Galvanized Surfaces: Clean galvanized surfaces with non- petroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

C. Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's directions.
1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
3. Use only thinners approved by the paint manufacturer, and only within recommended limits.

1..3 APPLICATION

A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
1. Paint colors, surface treatments, and finishes are indicated in "schedules."
2. Provide finish coats that are compatible with primers used.

3. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.
4. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.
6. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.
8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
9. Finish interior of wall and base cabinets and similar field- finished casework to match exterior.
10. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
11. Sand lightly between each succeeding enamel or varnish coat.
12. Omit primer on metal surfaces that have been shop-primed and touch up painted.

C. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.

D. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.

E. Mechanical items to be painted include but are not limited to:

1. Piping, pipe hangers, and supports.
2. Heat exchangers.
3. Tanks.
4. Ductwork.
5. Insulation.
6. Supports.
7. Motors and mechanical equipment.
8. Accessory items.

F. Electrical items to be painted include but are not limited to:

1. Conduit and fittings.
2. Switchgear.

G. Prime Coats: Before application of finish coats, apply a prime coat of material as recommended by the manufacturer to material that is required to be painted or finished and has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.

H. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.

I. 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.

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

1. Provide satin finish for final coats.

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

1..4 PROTECTION

A. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

1..5 EXTERIOR PAINT SCHEDULE **(application of anti-graffiti materials, Specification Section 09910, shall include all exposed exterior masonry, stucco and painted metal surfaces and shall be applied to required surfaces to a minimum height of 9'-0" above adjacent grade).**

A. Ferrous Metal: Primer is not required on shop-primed items.

1. Full-Gloss Alkyd Enamel: 2 finish coats over primer.

a. Primer: Synthetic Rust-Inhibiting Primer (FS TT-P-664).
b. First Coat: Alkyd Gloss Enamel (FS TT-E-489).
c. Second Coat: Alkyd Gloss Enamel (FS TT-E-489).

2. Deep Color, High-Gloss Alkyd Trim Enamel: Two coats over primer.

a. Primer: Alkyd-Type Zinc Chromate Primer (FS TT-P-645).
b. First Coat: Deep Color Alkyd Resin Exterior Trim Paint (FS TT-P-37).
c. Second Coat: Deep Color Alkyd Resin Exterior Trim Paint (FS TT-P- 37).

B. Zinc-Coated Metal:

1. High-Gloss Alkyd Enamel: 2 finish coats over primer.

a. Primer: Galvanized Metal Primer (FS TT-P-641).
b. First Coat: Alkyd Gloss Enamel (FS TT-E-489).
c. Second Coat: Alkyd Gloss Enamel (FS TT-E-489).

C. Concrete Sealer:

1. Penetrating Sealer: Water repellant coating for use over exterior sandblasted concrete, concrete masonry block, vertical pre-cast concrete and interior exposed concrete floors:

a. Dayton Superior: Weather Worker S-20 (20% Silane)
b. Tamms: Baracade Silane 20
c. Sonneborn: Penetrating Sealer 20

2. Penetrating Sealer for precast concrete caps:

    a. Dayton Superior Weather Worker S-40 (40% Silane)
    b. Sonneborn Penetrating Sealer 40
    c. Tamms Baracade Silane 40

1..6 INTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates, as indicated.

B. Gypsum Drywall Systems:

1. Odorless Eggshell Latex Finish: 3 coats with total dry film thickness not less than 2.5 mils.

    a. Primer: Interior Latex-Based White Primer (FS TT-P-650).
    b. First Coat: Interior Eggshell Latex.
    c. Second Coat: Interior Eggshell Latex.

C. Ferrous Metal:

1. Full-Gloss Enamel Finish: 2 coats over primer with total dry film thickness not less than 2.5 mils.

    a. Primer: Synthetic Rust-Inhibiting Primer (FS TT-P-664).
    b. Undercoat: Interior Enamel Undercoat (FS TT-E-543).
    c. Finish Coat: Exterior Alkyd Gloss Enamel (FS TT-E-506).

D. Zinc-Coated Metal:

1. Full-Gloss Enamel Finish: 2 coats over primer with total dry film thickness not less than 2.5 mils.

    a. Primer: Galvanized Metal Primer (FS TT-P-641).
    b. Undercoat: Interior Enamel Undercoat (FS TT-E-543).
    c. Finish Coat: Exterior Alkyd Gloss Enamel (FS TT-E-506).

E. Particle Board Wainscot:

1. Low lustre final finish.

    a. Stain: 234 Benwood Penetrating Stain or equal.
    b. Clear Polyurethane: 435 Benwood Low Lustre Polyurethane or equal (two applications).

F. Custom Faux Painting:

1. First Coat: Primer.

2. Second Coat: Latex accent color.

3. Third Coat: Latex accent color applied with sponge roller.

4. Fourth Coat: Ralph Lauren “Regent Metallics” (available at Home Depot), color as selected by Architect, applied with sponge roller.

1..7 EXTRA STOCK

A. At completion of installation, deliver to the owner one (1) unopened gallon of each paint type, color, texture and sheen. Label each container with paint type, color, texture, sheen **and room locations** where used.

END OF SECTION 09900

SECTION 09910 – ANTI-GRAFFITI COATING

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 surface preparation and application of anti-graffiti coating(s).

1. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections. **The application of anti-graffiti materials shall include all exposed new masonry, stucco and painted metal surfaces and shall be accomplished in accordance with manufacturer's recommended practices and standards. Anti-graffiti materials shall be applied to required surfaces to a minimum height of 9'-0" above adjacent grade.**

B. 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 will select from standard colors or finishes available.

C. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

1..3 DEFINITIONS

A. "Anti-graffiti materials" includes all coatings, materials, primers, emulsions and other applied materials as recommended and required by the manufacturer for a finished product that will allow for issuance of a manufacturer's warranty.

1..4 SUBMITTALS

A. Samples for all materials shall be submitted for approval by the Architect and owner.

1..5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide all materials produced by the same manufacturer or as required by the anti-graffiti coating manufacturer.

B. Material Quality: Provide the manufacturer's best quality trade material of the various coating types specified. Material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary names used are not intended to imply that products named are required or to

exclude equal products of other manufacturers.

1..6 DELIVERY, STORAGE, AND HANDLING

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

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Federal Specification number, if applicable.
4. Manufacturer's stock number and date of manufacture.
5. Contents by volume, for pigment and vehicle constituents.
6. Thinning instructions.
7. Application instructions.
8. Color name and number.

B. Store materials not in use in tightly covered containers in a well-ventilated area at temperatures recommended by the materials manufacturer. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1..7 JOB CONDITIONS

A. Apply materials only when temperatures of surfaces to be coated and surrounding air temperatures are at levels recommended by the manufacturer.

PART 2 - PRODUCTS

1..1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:

1. Rainguard International, 1079 Culpepper Drive, Conyers, CA 30094, Phone 949-765-2811, Fax 949-675-3450, Website www.rainguard.com.
2. Submittal for approval of similar products is permitted.

B. Specified Material: VandlTop Sacrificial Anti-graffiti Coating by Rainguard.
.

PART 3 - EXECUTION

1..1 EXAMINATION

A. Examine substrates and conditions under which application will be performed for compliance with requirements for application of materials. Do not begin material application until unsatisfactory conditions have been corrected.

1..2 PREPARATION

A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be coated, or provide surface-applied protection prior to surface preparation and coating. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of coating operations in each space or area, have items reinstalled by workers skilled in the trades involved.

1. Clean surfaces as recommended by materials manufacturer. Schedule cleaning and coating so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Surface Preparation: Clean and prepare surfaces to be coated in accordance with the manufacturer's instructions for each particular substrate condition and as specified.

C. Materials Preparation: Carefully mix and prepare materials in accordance with manufacturer's directions.
1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
2. Use only thinners approved by the materials manufacturer, and only within recommended limits.

1..3 APPLICATION

A. Apply anti-graffiti materials in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not apply materials over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable coating.
1. Paint colors, surface treatments, and finishes are indicated in "schedules."
2. Provide finish coats that are compatible with primers used.
3. The number of coats and film thickness required shall be as recommended and required by the materials manufacturer in order to issue the warranty.

C. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.

1..4 PROTECTION

A. Provide "wet paint" signs to protect newly coated surfaces.

1..5 WARRANTY

A. Provide a one-year manufacturer’s warranty, with all manufacturer’s requirements being met for issuance of the warranty.

END OF SECTION 09910

DIVISION 10 - SPECIALTIES

Section 10260	**Wall and Corner Guards**
Section 10500	**Metal Lockers**
Section 10522	**Fire Extinguishers**
Section 10800	**Toilet Accessories**

SECTION 10260 - CORNER GUARDS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Stainless steel corner guards.
   2. PVC corner guards.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:
   1. Section 06100 - Rough Carpentry.
   2. Section 09250 - Gypsum Board.
   3. Section 09900 - Painting.

1.2 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
   1. Shop Drawings:
      a. Submit shop drawings indicating dimensions, locations, types, sizes, and finishes for Architect's approval.
   2. Samples: Submit two 24 inch sections of wall guards and corner guards illustrating component design, configuration, color, and finish.

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

1.3 SEQUENCING

A. Coordinate installation with wall construction, including concealed blocking or anchoring devices, installation of wall base, and painting.

1.4 WARRANTY

A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include the following:
   1. Balco, Inc., Wichita, KS (316) 945-9328 or (800) 767-0082

2. Construction Specialties, Inc. (C/S), Muncy, PA (717) 546-5941 or (800) 233-8493
3. Pawling Corporation, Pawling, NY (914) 373-9300 or (800) 431-3456
4. Custom Fabricator Chosen by G.C. (for stainless steel only).

B. Section 01600 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.2 CORNER GUARDS

A. Provide stainless steel corner guards at non-public areas. De-burr all sharp edges. Round-off all corners.

B. Subject to compliance with requirements, provide PVC corner guards, at all public areas, by one of the following manufacturers:
1. Balco, Inc.: Corner Guards Surface Mounted Type CGS-3, 177P Graphite.
2. Construction Specialties, Inc. (C/S): Acrovyn – SM-20, III Wedgewood Blue.
3. Pawling Corp: Pro-Tek Corner Guards Surface Mounted CG – 10 with TC-10, A265 Windsor Blue.

C. PVC Corner Guards: Snap-on covers of Class 1 fire-rated resilient material, minimum 0.078 inch thick, free-floated over continuous aluminum retainer, 0.063 inch thick, surface mounted and anchored to wall at 20 inches on center maximum; molded end caps color matched to covers.

2.3. RUBBER WALL GUARD/BUMPER – NOT USED

2.4 ACCESSORIES

A. Provide attachment accessories as recommended corner guard manufacturer.

2.5 FABRICATION

A. Fabricate components with tight joints, corners, and seams.

B. Pre-drill holes for attachment.

C. 42" height.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing to the Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 INSTALLATION

A. Install in accordance with manufacturer's published instructions, square and plumb, secured rigidly in position.

B. Install above wall base.

C. For stainless steel corner guards, install with stainless steel screws and/or heavy-duty double-sided tape.

D. Stainless steel corner guards to be installed on all exposed corners in work areas not visible to public view.

E. PVC corner guards to be installed on all exposed corners in all public areas.

F. Clean all corner guards and adjacent surfaces affected by installation of the corner guards.

END OF SECTION 10260

SECTION 10500 - LOCKERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wardrobe locker units with hinged doors.
   2. Sloped tops and filler panels.
   3. Handicap accessible locker units.
   4. Locker room benches.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Wood Base by Division – 6.

1.2 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
   1. Product Data: Data on locker types, sizes, and accessories.
   2. Shop Drawings: Indicate layout, dimensions, details of fabrication and installation. Include plans, elevations, sections, and attachments to other Work.
   3. Assurance/Control Submittals:
      a. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
      b. Manufacturer's Instructions: Indicate component installation assembly, and installation instructions.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect Products.

B. Deliver materials to project site in manufacturer's original unopened protective packaging.

C. Identify contents, manufacturer, brand name, thermal values, and applicable standards.

D. Store materials in area protected from weather and construction operations.

E. Protect Work from damaged during transportation, storage at Project Site, and throughout tenure of work. Protect adjacent Work and materials from damage during progress of specified Work. Damaged Work shall be repaired or replaced at no additional cost to the owner. Furnish receipts of all loose or detachable parts.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturers offering products, which may be incorporated in the Work, include the following:
   1. HSS Industries, Incorporated, Traverse City, MI (800) 330-9701.
   2. Lyon Metal Products, Incorporated.
   3. Medart, Incorporated.
   4. Penco Products, Incorporated, Oaks, PA (610) 666-0500.
   5. Republic Storage Systems Company, Canton, OH (800) 477-1255.
   6. ASI Storage Solutions, Inc., 5717 Distribution Drive, Memphis, TN 38141, (901) 312-6195.
   7. Hadrian Manufacturing Inc., 7420 Clover Avenue, Menlor, OH 44060, (440) 942-9118.

B. Section 01600 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.2 MATERIALS

A. Type: Double Tier lockers with sloped tops and "Z" type metal base.

B. Sheet Steel: Commercial grade, mild annealed, cold rolled and stretcher leveled with the following thickness:
   1. Body and shelf: Minimum 24 gauge.
   2. Door Frames: Minimum 16 gauge:
   3. Tops and trim: Minimum 18 gauge.

C. Hinges: Minimum 2 inches high, 0.050 inch thick steel, 4 or 5 knuckle with spun over pin ends.

D. Fittings:
   1. Recessed locking handles with provisions for Contractor furnished padlocks.
   2. One double and three single prong coat hooks.
   3. Door numbers with numbers and directed.
   4. Rubber bumpers.

E. Locker Unit Size: 15 inches wide by 15 inches deep by 72 inches high.

F. Bodies: Formed and flanged.

G. Door Frames: Formed channel shaped, welded and ground flush.

H. Doors: One piece with vertical edges channel shaped, top and bottom, flanged at 90 degree angle, hinges welded to door and bolted to frame and ventilation louvers and top and bottom.

I. Sloped tops: Continuous with closed ends where exposed.

J. Fasteners and Anchors: As recommended by locker manufacturer.

K. Finish:
   1. Preparation: Clean, degrease and neutralize.
   2. Paint Materials and Application: Powder coat or electrostatically sprayed with heavy coat high quality enamel and baked at 300 degrees Fahrenheit, capable of withstanding hammer test without chipping and flaking.
   3. Finish Color: As selected by Architect.

L. Padlocks: Combination lock with master-key operation at back of lock.

M. **ADA Compliant Locker: Fit two lockers per each locker room with additional lower hooks and shelf to meet ADA requirements. Provide locker with ADA compliant latch.**

2.3 BENCH MATERIALS

A. Hardwood bench top with clear finish. Provide in length as shown on plans.

B. Provide with heavy-duty pedestals. Pedestals to be heavy duty steel tube welded to top and bottom flanges, and anchored to floor.

C. The bench shall meet or exceed the following requirements and shall be in compliance with ANSI A117.1-3003 Section 903:

Bench size: 1 1/4” thick hardwood seat, 4’-0” long, 20”-24” wide, 17”-19” from floor to top of seat.

Support: Provide at least four (4) heavy duty steel tube pedestals, anchored as described in Paragraph B.

The bench shall be installed adjacent to the finished wall surface.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the owner.

3.2 PREPARATION

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication of special components, when possible, to ensure proper fitting of work. However, allow for adjustment and fitting of trim and filler panels whenever taking of field measurements before fabrication might delay Work.

3.3 INSTALLATION

A. Install metal lockers at locations indicated on Drawings in accordance with manufacturer's published instructions.

B. Install lockers plumb, level, rigid, and flush.

C. Space fastenings about 48 inches on center, unless otherwise recommended by manufacturer. Install through back-up reinforcing plates where necessary to avoid metal distortion. Conceal fasteners.

C. Install trim where indicated, use concealed fasteners to provide flush, hairline joints with adjacent surfaces.

3.4 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field testing and inspection.

B. Inspect installation of lockers, attachment, and alignment with adjacent finishes.

C. Operate locker doors and locking devices.

3.6 ADJUSTING AND CLEANING

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

B. Touch-up marred finishes. Use only materials and procedures recommended or furnished by locker manufacturer. Replace units which cannot be restored to factory-finished appearance.

END OF SECTION 10500

SECTION 10522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

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. Provide Drawings and Specifications acceptable to the Owner for the following:
   1. Fire extinguishers.
   2. Mounting brackets.

B. Related Sections: The following sections contain requirements that relate to this section:
   1. Division 15 Section "Fire Protection" for fire protection systems.

1..3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain fire extinguishers and cabinets from one source from a single manufacturer.

B. UL-Listed Products: Fire extinguishers UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher.

C. FM-Listed Products: Fire extinguishers approved by Factory Mutual Research Corporation for type, rating, and classification of extinguisher and carry appropriate FM marking.

PART 2 - PRODUCTS

1..1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1..2 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, which comply with requirements of governing authorities.

B. Multipurpose Dry Chemical Type: UL-rated 4-A:60-B:C, 10-lb. nominal capacity, in enameled steel container.

1..3 MOUNTING BRACKETS

A. Provide brackets designed to prevent accidental dislodgement of extinguisher, of sizes required for type and capacity of extinguisher indicated in plated finish.

PART 3 - EXECUTION

1..1 INSTALLATION

A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

END OF SECTION 10522

SECTION 10800 - TOILET ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Toilet Accessories.
   2. Attachment hardware.

B. Types of toilet accessories required include the following:
   1. Mirrors with stainless steel frame, and mirrors with stainless steel shelf, one per restroom.
   2. Handicapped grab bars, 2 per handicapped restroom.
   3. Utility shelf/mop and broom holder, one per janitor's room.

C. Related Documents: The Contract Documents, as defined in the General Conditions, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

D. Related Sections:
   1. Section 06100 - Rough Carpentry: Placement of backing and blocking for attachment of accessories.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 123 - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   2. ASTM A 167 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   3. ASTM A 366 - Specification for Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
   1. Product Data: Data for each accessory describing size, finish, details of function, and attachment methods.
   3. Assurance/Control Submittals:
      a. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Conform to current ADA requirements for mounting heights and locations of accessories.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect products.

B. Deliver accessories in original labeled packaging, bearing manufacturer's name and type of accessory.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturers offering specified items, which may be incorporated in the Work, include the following:
   1. American Specialties Company, Incorporated, Deer Park, NY (914) 476-9000.
   2. Bobrick Washroom Equipment, Incorporated, Jackson, TN (901) 424-7000.
   3. Bradley Corporation, Milwaukee, WI (414) 354-0100.
   4. McKinney Parker Company, Scranton, PA (717) 969-9770.
   5. Raymond Engineering, Inc. (REI), St. Paul, MN (800-365-5770

B. Section 01600 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.2 MATERIALS

A. Sheet Steel: ASTM A 366.

B. Galvanized Sheet Steel: ASTM A 366, ASTM A 123 to 1.25 ounces per square yard.

C. Stainless Steel Sheet: ASTM A167, Type 304/302, with polished No. 4 finish 22 ga. (.034”) minimum, unless otherwise indicated.

D. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof.

E. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

F. Mirror Glass: FS DD-G-451, Type I, Class 1, Quality q2, 1/4" thick, with silver coating, copper protective coating, and non-metallic paint coating complying with FS DD-M-411.
Frame with stainless steel frame. See above.

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

2.3 MANUFACTURED UNITS

A. Mirror with Stainless Steel Channel Frame (one per restroom):
   1. Model Numbers:
      a. American Specialties: 0620.
      b. Bobrick: B-165 series.
      c. Bradley: 781.
      d. McKinney: 190.

   2. Description: 24 inches wide x 36 inches high. Minimum 18 gage 1/2 inch x 1/2 inch x 1/2 inch stainless steel frame with 90 degree mitered hairline corners mechanically interlocked. Type 430 bright-polished finish. Galvanized steel back with integral horizontal hanging brackets for mounting on concealed wall hanger, secured with concealed wall vandal proof screws in lower frame. Edges and back protected by shock-absorbing water-resistant padding.

B. Grab Bar - 36 Inch (one per restroom):
   1. Model Numbers:
      a. American Specialties: 3100 series.
      b. Bobrick: B-5507x36.
      c. Bradley: 832 series.
      d. McKinney: 9602.
   2. Description: 1-1/4 inch diameter (1-1/2 inch diameter when required by local code) 36 inch long, horizontal, 1-1/2 inch wall clearance. Type 304 minimum 18-gage stainless steel. Concealed screw attached mounting and anchorage. No. 4 satin finish. Minimum 900-pound supporting capacity. Non-slip texture grip surface.

C. Grab Bar - 42 Inch (one per restroom):
   1. Model Numbers:
      a. American Specialties: 3100 series.
      b. Bobrick: B5507x42.
      c. Bradley: 832 series.
      d. McKinney: 9602.
   2. Description: 1-1/4 inch diameter (1-1/2 inch diameter when required by local code) 42 inch long, horizontal. 1-1/2 inch wall clearance. Type 304 minimum 18-gage stainless steel. Concealed screw attached mounting and anchorage. No. 4 satin finish. Minimum 900 pound supporting capacity. Non-slip texture grip surface.

D. Grab Bar - 18 Inch (one per restroom):
   1. Model Numbers:
      a. American Specialties: 3100 series.
      b. Bobrick: B5507x42.
      c. Bradley: 832 series.
      d. McKinney: 9602.
   2. Description: 1-1/4 inch diameter (1-1/2 inch diameter when required by local code) 42 inch long, horizontal. 1-1/2 inch wall clearance. Type 304 minimum 18-gage stainless steel. Concealed screw attached mounting and anchorage. No. 4 satin finish. Minimum 900 pound supporting capacity. Non-slip texture grip surface. Mount vertically.

E. Utility Shelf/Mop and Broom Holder (one per janitor's room)
   1. Model Number:
      a. Bobrick: B-224 (or equal).
   2. Description: Surface-mounted utility shelf with holders for mops and brooms designed to keep mops and brooms away from wall. Spring loaded rubber cam holders, hooks for rags and rod below shelf for hanging wet rags

2.4 FABRICATION

A. Weld and grind smooth joints of fabricated components.

B. Form exposed surfaces from single sheet of stock, free of joints. Form surfaces flat without distortion. Maintain surfaces without scratches or dents.

C. Fabricate grab bars of tubing, free of visible joints, return to wall with end attachment flanges.

D. Shop assemble components and package complete with anchors and fittings.

E. Provide steel anchor plates, adapters, and anchor components for installation.

F. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify correct location of opening in wall for recessed accessories.
   2. Verify that attachment blocking and backing plates are in place in the correct location for accessory connections.

C. Report in writing to Architect any prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the owner.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for scheduled installation.

B. Provide and use templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install fixtures, accessories, and items in accordance with manufacturer's instructions, ADA requirements, and as indicated on Drawings. Use tamper-proof fasteners.

B. Install plumb and level, securely and rigidly anchored to substrate.

3.4 ADJUSTING AND CLEANING

A. Adjust accessories for proper operation and verify mechanisms function smoothly.

B. Remove temporary labels and protective coatings. Clean and polish exposed surfaces.

END OF SECTION 10800

DIVISION 11 - EQUIPMENT

Section 11160 Loading Dock Equipment

SECTION 11160 - LOADING DOCK EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Dock leveler, electro-hydraulic
   2. Dock bumpers.
   3. Dock seal.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

1.2 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

   1. Product Data:
      a. Levelers and Lifts: Indicate materials and finish, installation details, roughing-in measurements, and operation of unit.
      b. Dock seals: Indicate unit dimensions, method of anchorage, and details of construction.

   2. Shop Drawings: Indicate required opening dimensions, tolerances of opening dimensions, placement dimensions, and perimeter conditions of construction.

   3. Assurance/Control Submittals:
      a. Test Reports: Report from approved Independent Testing Agency indicating compliance of Dock Lift with requirements of ANSI MH14.1.
      b. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
      c. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.

1.3 QUALITY ASSURANCE

A. Dock leveler : Conform to requirements of ANSI MH14.1.

B. Qualifications:
   1. Manufacturer: Company specializing in manufacturing Products specified with minimum 5 years documented experience.
   2. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect Products.

PART 2 PRODUCTS

2.1 HYDRAULIC DOCK LEVELERS

A. Manufacturers: Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include the following:
   1. Blue Giant Corporation, Pell City, AL (800) 872-2583.
   2. Kelley Company Incorporated, Milwaukee, WI (800) 558-6960.
   3. Pentalift Equipment Corporation, Buffalo, NY (519) 763-3625.
   4. Rite-Hite Corporation, Milwaukee, WI (800) 456-0600.
   5. Section 01600 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

B. Models:
   1. Blue Giant: A 6810
   2. Kelley
   3. Pentalift: HD 610
   4. Rite-Hite: HD 1600

C. Description:
   1. Operation: Electro-hydraulic.
   2. Deck Length: 10 - 0" (with additional 16" to 18" lip).
   3. Deck Width: 6' - 0".
   4. Operating Range: 12 inches above to 10 inches below dock level.
   5. Capacity: 20,000 pounds (minimum).
   6. Wall mounted motor control unit with emergency stop button.
   7. Fully insulated deck with brush weather seal.
   8. Telescoping toe guards.
   9. Electrical interlock so that leveler will not operate until dock door is in the open position.
   10. Maintenance strut.
   11. Warranty: 10 year parts and labor.
   12. **Dock leveler supplier to verify and ensure that the operating voltage and other electrical features of the leveler is compatible with the voltage and other electrical systems shown for the leveler on the electrical drawings.**

2.2 DOCK BUMPERS

A. Manufacturers: Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include the following:
   1. Blue Giant Corporation, Pell City, AL (800) 872-2583.
   2. Kelley Company Incorporated, Milwaukee, WI (800) 558-6960.
   3. Rite Hite Corporation, Milwaukee, WI (800) 456-0600.
   4. Section 01600 - Product Requirements: Product options and substitutions. Substitutions: Permitted

B. Description:
   1. Laminated Tread Bumpers: Provide at pit mounted dock leveler, 4 1/2” thick x 20” high x 11” wide, fabricated from recycled tires, cut resistant protection and high impact absorption.
   2. Bumpers at edge of dock flip ramp shall be provided, coordinated, and installed by/with edge of dock flip ramp.
   3. T-shaped solid molded rubber bumpers are to be installed on face of dock in dumpster location (see building elevations).

2.3 DOCK DOOR SEALS

A. Fixed-head pads with adjustable head curtains and beveled side pad Dock Door Seals: provide at each dock space. Fabricate units of compressable polyurethane, covered with a fabric and 4” exposure plates. The dock seals shall have compression vents, drain holes and be secured, and ready to receive Work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing to the Architect any prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the owner.

3.2 INSTALLATION

A. Install dock seal and dock bumpers in accordance with manufacturer's instructions.

B. Install dock leveler in prepared openings in accordance with manufacturer's instructions.

C. Set square and level.

D. Anchor units securely, flush with dock. Weld back of leveling dock to pit frame. Touch-up weld with primer.

3.3 ADJUSTING

A. Adjust installed unit for smooth and balanced operation.

END OF SECTION 11160

DIVISION 12 - FURNISHINGS

Section 12484 Walk-off Mat

SECTION 12484 - WALK OFF MAT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: New carpet tile and accessories for direct glue down installation.

B. Alternates or Substitutions: Approval of alternate or substitute products will be considered only under the terms and conditions as outlined below:

Whenever a particular make of material or trade name is specified herein, it shall be regarded as being indicative of the standards required. Regardless of format of specifications, any product other than those named in Part 2 -Products, item number 2.01, must proceed as an alternate or substitute. A bidder who proposes to quote on the basis of an alternate or substitute material or system shall submit to the architect, at least ten (10) days prior to the scheduled bid date, the following information:

1. Written application for approval of alternate or substitute to include specifications of alternate or substitute carpet on company letterhead and signed by company officer.
2. Include completed and signed checklist from Section 2.03.
3. Sixteen (16) 24” x 24” samples of the proposed alternate or substitute with recommended backing technology to provide a mock-up of the pattern.
4. A complete sample representation of colors available.
5. Copies of warranties for proposed alternate or substitute.
6. List of a minimum of three (3) jobs, one of which must be in use for at least ten (10) years, where alternate or substitute is/was used under similar conditions. These jobs shall be located within one hundred (100) miles of the owner's office. Each job shall be available for inspection by the owner's representatives.
7. Consideration will be given to only those alternates or substitutes that are approved prior to scheduled bid opening date.
8. List of approved alternates or substitutes will be issued to all bidders prior to bid opening.

C: General: The following publications of the issues listed below, but referred to hereinafter by basic designation, form a part of this specification to the extent as if bound herein: American Society for Testing and Materials (ASTM):

1. E662 – Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
2. E648 – Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.02 SUBMITTALS

A. Layout Drawings: Show layout of each carpet type installation, at 1/8" scale.

B. Samples: Submit for verification purposes, one full tile of each carpet required. Samples shall be accompanied by manufacturer's technical specification for each carpet required using terminology characteristics as listed in this specification. Also include a complete representation in sample form of all available colorations.

C. Maintenance Data: Submit manufacturer's printed maintenance recommendations for the care, cleaning, and maintenance of the carpet, including detailed instructions pertaining to hot water extraction methods.

1.03 QUALITY ASSURANCE

A. Flooring Contractor's Qualifications: Firm with not less than 5 consecutive years of experience in installation of commercial carpeting of type, quantity and installation methods similar to work of this section. FLOORING CONTRACTOR SHALL SUBMIT WITH BID PROPOSAL WRITTEN CERTIFICATION FROM CARPET MANUFACTURER, DEMONSTRATING THEIR FIRM IS AN AUTHORIZED DEALER.

B. Manufacturer's Qualifications: Firm (carpet mill) with not less than 5 consecutive years of production experience with carpet similar to type specified in this section; whose published product literature clearly indicates general compliance of products with requirements of this section.

C. Measurement Verification: Dimensions shown on drawings are approximate. It is the Flooring Contractor's responsibility to verify all dimensions and job site conditions; order sufficient yardage to fully carpet areas as indicated and to fill overage requirements as specified. No substitutions shall be permitted to make up for any shortage of material in overage or in carpet to be installed.

D. Flooring Contractor shall be totally responsible for the accuracy of his measurements of total yardage, individual floor yardage, and dye lot yardage requirements, extra yardage for pattern match, and roll length requirements; no additional compensation shall be allowed for shortage of materials.

E. Dye Lots: All carpet of the same type in continuous areas shall be from the same dye lots.

F. Owner reserves the right to test carpet at their expense to verify that the delivered carpet is as specified. If carpet does not meet specifications, manufacturer will reimburse owner the testing expense and the carpet may be rejected.

1.04 PRODUCT DELIVERY, STORAGE & HANDLING

A. Deliver carpeting materials in original mill protective package with mill register numbers and tags attached. Maintain wrappers and protective covers in place until carpet is ready for installation. Store inside, in well-ventilated area, protected from weather, moisture and soiling.

B. Cutting: Before beginning installation, it shall be inspected for defects, color variations, or shipping damage and be immediately replaced if any of these conditions exist at no additional cost to the Owner. Carpet tiles shall be inspected to insure that carpet tiles are from the same dye lot.

C. **Deliver all required overages and maintenance stock to owner's specified location prior to beginning installation.**

1.05 JOB CONDITIONS

A. Environmental Conditions: Maintain temperatures in space in accordance with carpet manufacturer's recommendations, but in no case less than 60 degrees F for 24 hours prior to, during and after installation. Subfloor temperature should be a minimum 60 degrees F for 24 hours prior to and after installation.

B. Precondition: All of the carpet shall be stored in a room on site 24 hours prior to actual installation with the room preconditioned at a minimum of 60 degrees F with humidity between 35% to 65%.

1.06 SEAMING REQUIREMENT

A. General: In addition to the requirements and recommendations of the Carpet Manufacturer, the following criteria shall be adhered to:
   1. Installation layout shall enable future replacement, especially in large open areas and traffic paths, unless specifically indicated in writing by owner or owner's representative.
   2. No carpet tile pieces smaller than 6” in width or length shall be used.
   3. Seams occurring at doors of different types of carpet shall be parallel to closed door, and be centered directly under the closed door.
   4. Flooring Contractor is responsible for trimming all loose yarn and fuzzy edges of carpet tiles.
   5. All cutting of carpet for telephone and electrical outlets shall be the responsibility of the Flooring Contractor.

1.07 WARRANTY

A. General: Provide special warranty, signed by Flooring Contractor, and Carpet Manufacturer, agreeing to repair or replace defective materials and workmanship of carpeting work during a 10 year warranty period following date of Substantial Completion. Attached copies of product warranties as required in Part 2, item 2.01 of this specification section for warranties required.

1.08 EXTRA STOCK

A. General: Furnish 5% additional yardage of each carpet type required; extra yardage is over and above any overage provided by manufacturer. Normal manufacturing overage not to exceed 10% for under 1000 yards, not to exceed 5% for over 1000 yards. Deliver to the Owner uncut in clearly marked dust-proof packages **prior to commencement of work**; store where directed.

PART 2 - PRODUCTS

2.01 CARPET

1. Carpet Type CPT-1: Lees “FirstStep” Carpet Tile
   Carpet shall meet the following minimum requirements:
   1. Construction: Tufted.
   2. Surface Texture: Performance Loop Pile.
   3. Pile Thickness: .249” avg.
   4. Stitches Per Inch: 8.5
   5. Gauge: 5/32”
   6. Yarn Weight: 38 oz. per sq. yd. minimum.
   7. Face Yarn: Type 6,6 Antron Legacy Nylon by Invista with Nylon 6,6 Scarper Yarn.
   8. Primary Backing: Reinforced synthetic
   9. Secondary Backing: Fiberglass reinforced thermoplastic composite
   10. Bonding Agent: Premium Vinyl
   11. Size: 24” x 24”.
      a. Static Control: Less than 3.0 KV when tested under Standard Shuffle test (70

degrees, 20% RH)

12. Flammability:
    A. DOC-FF-1-70 Pill Test: Passes.
    B. Floor Radiant Panel: Meets NFPA Class 1 when tested per ASTM-E-648 glue down.
16. NBS Smoke Chamber NFPA 258: Less than 450 Flaming Mode.
17. Color Fastness:
    A. Lightfastness - AATCC 16E-1982 - Dark color: Gray scale rating of 4 or better after 160 standard fading hours as compared to AATCC Gray Scale for evaluation change in color.
    B. Ozone and Gas - AATCC 129-1981 - Rating 3 or better per color AATCC transference scale.
18. Indoor Air Quality: Manufacturer must demonstrate that carpet is certified under the CRI Green Label Plus Program.
19. Carpet Manufacturers: Subject to compliance with specifications, the following manufacturers and products are approved:
    A. Lees Carpets – FirstStep T (L8513), Contact: Customer Service 800 523-5647
20. Pattern and Color: Understanding the importance of pattern and color for aesthetics, as well as appearance retention and maintainability, the architect reserves the right to reject any product or manufacturer based solely on pattern and color considerations.

B. WARRANTIES

1. Definition of Lifetime: Lifetime is defined as the period from which materials are installed until the date in which the owner removes them from service.
2. Lees Carpets manufacturer's Lifetime Warranty, non-prorated, against product failure covering all costs including freight, labor, and material for the following:
   - Edge Ravel/Tuft Bind.
   - Back lamination.
   - Static protection as stated above.
   - Wear - No more than 10% Face Yarn Loss.
   - Cup, Dome, Dish
   - Dimensional stability
   - Adhesive bond to the floor
3. Installation Warranty: Lifetime Warranty, non-prorated, against any installation related failure covering all costs including freight, labor, and material co-signed by the flooring contractor and the manufacturer.

C. ENVIRONMENTAL ATTRIBUTES – LEED Criteria

1. Environmental claims by manufacturer must comply with FTC guidelines.
2. Recycled Content: Carpet must contain either 20% post-consumer recycled content **OR** a minimum of 35% post-industrial recycled content based on total product weight.
3. Carpet Face Yarn: In accordance with Executive Order 13101, carpet face yarn must be third party certified as an Environmentally Preferred Product (EPP).
4. Low Emitting Materials: Carpet and all installation components including adhesives, sealers, seam welds and seam sealers must meet the *Low Emitting Materials* standards as outlined in U.S. Green Building Council LEED criteria. Carpets should pass the CRI Green Label Plus Program in terms of VOC emissions. Adhesives must meet VOC emissions standards per South Coast Air Quality Management District Rule #1168.

5. End of Life Reclamation: Carpet must have an existing methodology actively in place to achieve landfill diversion. Refer to Section 3.03 of this section for specific requirements for reclamation of material.

2.02 ACCESSORIES

A. Adhesives: Lees Pressure Sensitive waterproof, non-flammable carpet adhesive recommended and approved by carpet manufacturer in writing for compatibility with carpet backing. All floor sealers, seam sealers, and adhesives shall contain no calculated solvents per OSHA Regulation 29 CFRE 1910.1200, have no calculated VOC's, be non-flammable, and meet the criteria of the CRI Green Label Plus Certification Program. MSDS and samples required on products used.

B. Miscellaneous Materials: As recommended and approved in writing by manufacturer of carpet, and selected by Flooring Contractor to meet project circumstance and requirements, including Lees EverSeal subfloor sealer.

C. Protection Paper: Fortifiber Corporation "Seekure 892", or approved heavy, reinforced, non-staining kraft laminated paper.

2.03 SUBMITTAL CHECKLIST

A. Checklist Instructions: For all submittals for alternates or substitutes, submitter must include the checklist below, completely filled out and signed by an officer of the company. Failure to provide this documentation will result in rejection of submittal.
   1. Fill-in the left column with the actual data as it pertains to your alternate or substitute. If more room is required, attach additional pages.
   2. Circle either yes or no indicating whether or not the submitted product meets or exceeds the specification requirements for each checklist item.

B. Checklist Form: See next page.

C. Checklist Form:

   1. Submitting company's name: _____

   2. Checklist preparer's name: _____

   3. Submitted product manufacturer: _____

   4. Submitted product style name: _____

5. Checklist:

Specification Citation: (Please enter submittal information)	**Circle Answer**
Section 09681 Part 2.01.A, B, C, and D:	
1. Construction:	YES / NO
2. Surface Texture:	YES / NO
3. Pile Thickness:	YES / NO
4. Gauge:	YES / NO
5. Stitches:	YES / NO
6. Yarn Weight:	YES / NO
7. Density:	YES / NO
8. Face Yarn:	YES / NO
9. Dye System:	YES / NO
10. Dry Soil Retardant:	YES / NO
11. Primary Backing:	YES / NO
12. Secondary Backing:	YES / NO
13. Bonding Agent:	YES / NO
14. Size:	YES / NO
15. Sq. Yds. per Carton:	YES / NO
16. Static Control:	YES / NO
17. Flammability:	YES / NO
18. NBS Smoke Chamber:	YES / NO
19. Color Fastness:	YES / NO
20. Indoor Air Quality:	YES / NO
21. Carpet Lifetime Warranty (Part B, Item 1& 2)	YES / NO
22. Installation Lifetime Warranty (Part B, Item 3):	YES / NO
23. Cationic Stain Resistance (Part C, Item 1):	YES / NO
24. Environmental Attributes (Part D, Items 1-4):	YES / NO

6. Preparer's Signature and Date:_____

PART 3 - EXECUTION

3.01 INSPECTION

A. General: Do not start work until work of other trades is substantially completed. Inspect surfaces to receive carpet and verify that all such work is complete to the point where this installation may properly commence. In the event of discrepancy, notify Construction Manager. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved. Start of carpet installation indicates acceptance of subfloor conditions and full responsibility for completed work.

B. Materials: Inspect all goods to verify all goods uniformity, quality, color and texture against the approved samples prior to installation. Any discrepancy should be brought to the attention of the Construction Manager.

3.02 INSTALLATION, GENERAL

A. General: Comply with manufacturer's instructions and recommendations for installation of this type of carpet by the glue down method.

B. Prepare the subfloor to insure a successful installation. Utilize a floor sealer such as Lees Everseal where needed or recommended by manufacturer.

C. Carpeting shall be installed in the quarter-turn form. Cut carpet evenly and accurately to fit neatly at walls, columns, and projections. Extend carpet under open-bottomed and raised-bottom obstructions, and under removable flanges of obstructions.

D. Installed carpet shall be free from ripples, ravels, frays, puckers and raw exposed edges. All loop pile carpets will demonstrate some fuzzy edges due to normal manufacturing conditions. <u>It is the carpet installer's responsibility to trim all edges to eliminate fuzzy seams.</u>

E. Expansion Joints: Do not bridge building expansion joints with continuous carpeting, provide for movement.

3.05 CLEANING AND PROTECTION

A. Remove and dispose of debris and unusable scraps.

B. Vacuum carpet using two motor, top loading, upright commercial machine with brush-only element, utilizing a high filtration dust bag. Remove spots in accordance with carpet manufacturer's guidelines and replace carpet where spots cannot be removed. Remove any protruding face yarn using sharp scissors. Be certain to trim any loose yarns or fibers at all seams.

C. Following cleaning and vacuum, carefully protect the carpeting from soiling and damage until final acceptance. Protection shall be accomplished by using approved protection paper. Edges shall be lapped 6 inches and secured with non-asphaltic tape. Covering shall be kept in repair and damaged portions replaced during the construction and move-in period.

D. Maintenance Materials: Deliver usable, uncut carpet tiles to Owner's designated storage space, properly packaged and identified. Dispose of smaller pieces as construction waste.

END OF SECTION 12484

DIVISION 13 - SPECIAL CONSTRUCTION

Section 13900 Fire Suppression

SECTION 13900 - FIRE SUPPRESSION

1..1 GENERAL CONDITIONS

A. The requirements of Division 15 Sections shall govern the work of this Section, where applicable, and where not in conflict with governing codes and ordinances. Division 1 is a part of this and all other sections of these specifications.

1..2 SCOPE

A. The work required includes the designing, hydraulically calculating pipe sizes, flows, and pressure, furnishing and installation of fire protection systems in accordance with the specifications, latest standards and codes for complete systems for the building.

B. The work specified in this section shall be installed by none other than a recognized fire sprinkler contractor. All fire protection system piping shall be hydraulically calculated. All systems shall be subject to the inspection and approval of the local fire authority or his representative for compliance of applicable standards.

C. All work shall be coordinated with other subcontractors.

D. The sprinkler system shall consist of the required number of sprinkler heads, piping, hangers, drains, test pipes, alarms, valves, gauges, fire department connections, and all other parts to assure a complete system to meet the requirements of the owner's insurance underwriter, local authority having jurisdiction, and in accordance with nationally recognized standards.

E. Cold exposure areas shall be covered by either an anti-freeze or dry system sprinkler system, at the contractor's option.

1..3 CODES AND STANDARDS

A. Water Supply: National Fire Code #24 - Uniform Building Code.

B. Wet Sprinkler System & Combined Systems: N.F.C. #13 & #14 - U.B.C.

C. Alarm Equipment: N.F.C. #70 & 72A.

D. Standpipe & Hose Systems: (Applicable for high-rise construction only) N.F.C. #14 - U.B.C.

E. Supervision: N.F.C. #13 & #14 - U.B.C.

F. Temporary Fire Protection: N.F.C. #14 - U.B.C.

G. Sprinkler Heads: N.F.C. #13.

H. Sleeves and Location: N.F.C. #13.

I. Underground Mains: N.F.C. #24.

J. Excavation and Backfill: 02200 of this specification.

1..4 WORK INCLUDED ELSEWHERE

A. Fire Hydrants - by Plumbing Contractor.

B. Concrete Work - by General Contractor.

C. Access Doors - by General Contractor.

D. Painting of sprinkler piping - By Mechanical and/or Painting Contractor.

E. Color coding or pipe identification - By Mechanical Contractor.

F. Wiring of flow switches and gate valve supervisory switches - By Electrical Contractor.

1..5 WORK BY FIRE PROTECTION CONTRACTOR

A. This contractor shall furnish and install all labor, material, and equipment to make a complete and working fire protection system fully tested and approved in accordance with the drawings, standards of this specification for the new building.

B. Contractor shall perform flow test at site.

1..6 UNDERGROUND WATER SUPPLY

A. Connect fire sprinkler mains to connections provided by others as shown on the drawings and install U.L. labeled pipes into building at locations shown. Test and flush this portion of main in accordance with N.F.C. #24 and furnish test certificates to the Owner's representative.

B. The fire sprinkler contractor is responsible for the main connection, detector check valve, post indicator valve and the fire main into the building.

C. Available water supply has been measured by a fire hydrant test. See the Site Utilities Plan for more information.

1..7 EXCAVATION & BACKFILL

A. Excavation and backfill shall be done by this contractor under the provisions of Division 2 Sections.

1..8 SPRINKLER SYSTEM

A. This system shall conform to N.F.C. #13 and U.B.C. Riser may be calculated, but shall not be smaller than 6". Sprinkler systems are to be light, ordinary, or extra hazard, as required by NFC-13 and the local fire authority.

B. System shall be hydraulically calculated. Sprinkler system shall be light hazard, except for casual ordinary and extra hazard group 1 in service areas. Density for light hazard areas shall be 0.10 gpm per sq. ft. over 1500 sq. ft. Remote area with a maximum head spacing of 225 sq. ft. Service area shall be density of 0.15 over 2000 sq. ft. with

maximum spacing of 130 sq. ft.

1..9 QUALIFICATION OF DESIGNER

A. Designer shall be an engineering technician or Senior Engineering Technician (Level III or Level IV), NICET certification for fire sprinkler system design.

1.10 QUALIFICATION OF INSTALLER

A. It is intended that the system be designed and installed by a firm regularly engaged in the design and installation business of Fire Sprinkler contracting. The Owner's representative may require evidence to support the ability of the contractor to perform work in the scope and volume as specified. A contractor who cannot verify such experience, may be found not suitable to perform the work.

PART 2 - PRODUCTS

2..1 HANGERS

A. All hangers to be in accordance with NFPA Pamphlet No. 13.

B. Special drilled inserts required at all post-tensioned concrete floor slabs.

1. Drill hole in bottom of post-tensioned concrete slab. Coordinate diameter with insert used**. IMPACT HAMMER/DRILL IS NOT ALLOWED**.
2. Insert: “1/4” diameter x l-1/4” “tie-wire spike” (#3759), or mushroom head spike (#5523) by Powers Rawl 914-235-6300, or approved equal.
3. Use these (or similar) inserts to attach <u>anything</u> to the bottom surface of the post-tensioned concrete slab. Installer to provide anchors as required by local jurisdictions, which are compatible with the post-tensioned concrete slab.

2..2 RISERS

A. The riser shall be at the locations shown and shall include a U.L. approved control valve, check valve, flow switch, pressure gauges, water motor gong, or electric bell, standard fire department connection, gate valve supervisory switch, test connections, and drains as required.

2..3 SPRINKLER HEADS

A. Sprinkler heads shall be U.L. approved. "K" factors shall be the same on each system and/or floor. In all other ceiling areas, chrome-plated recessed type heads with white canopies similar and equal to that manufactured by Reliable.

B. Sprinklers shall be of the proper temperature rating. Location of sprinkler head wherever reasonably possible shall be symmetrical and coordinated with the ceiling pattern.

C. Number and location of sprinkler heads shown on the drawings are schematic. Exact number and location of heads shall be determined by the system design, and architectural coordination.

D. Provide dry pendent heads in areas subject to freezing, only where wet piping can be run in heated space. Otherwise, provide antifreeze loops.

E. Provide sparehead cabinets in accordance with NFPA No. 13 and equip same with at least ten (10) chrome heads, six (6) brass heads, and appropriate wrenches.

F. Provide head guards in all areas where heads are subject to physical abuse.

2..4 VALVES

A. All valves and fittings shall be listed by Underwriters Laboratories or approved by Factory Mutual for fire protection duty and shall be installed in accordance with their listing and/or approval. Control valve shall have alarm supervisory switches with two sets of contacts and normally open/normally closed.

B. All indicating valves will be of the listed and/or approved type with an electric tamper switch approved for use with that valve.

C. Water hammer arrestors shall be provided ahead of all automatic valves to eliminate water hammer and shall be installed vertically in an accessible location.

D. Hose valves off standpipes shall be U.L. approved. All valves shall be 2-1/2" with 2-1/2" x 1-1/2" reducer and cap with chains. Valves shall be polished brass and chrome-plated.

2..5 PIPING

A. All piping above ground shall be Schedule 40 domestic steel pipe and fittings.

B. Thinwall and foreign-made pipe <u>will not</u> be permitted on this project.

2..6 EARTHQUAKE BRACING

A. Install earthquake bracing in accordance with NFPA #13 Standards and local Fire Marshall's Office.

2..7 SLEEVES

A. Sleeves shall be furnished, together with their location and elevations to the construction manager, timely with required schedule or concrete pours. If sleeves are missed by this contractor, he shall be responsible for core drilling through concrete at this own expense, and he shall be responsible for his cutting and patching. Sleeves shall be of the size, type, and length required by NFPA codes. See Section 15050 for "Sleeves".

PART 3 - EXECUTION

3..1 TEMPORARY FIRE PROTECTION DURING COURSE OF CONSTRUCTION

A. This contractor shall provide fire protection as required by N.F.C. #14 - Chapter 8, and shall be coordinated with the local City Fire Department.

3..2 SHOP DRAWINGS

A. Show drawings, submittals, and hydraulic calculations, as necessary and required, shall be submitted to the Owner's representative for approval prior to incorporating materials or equipment into the work. Shop drawings shall be complete and in accordance with N.F.C. #13, #14, #20, and all applicable standards, submittals, and equipment, valves, flow switches, controls, and other important items shall be complete, showing details, description, and characteristics; hydraulic calculations shall show flows, pressures, velocities, pipe size, and equivalent lengths as required for the system.

B. Calculations shall be arranged in an orderly manner with sufficient reference points for the approving authority to review and approve.

C. Testing shall be accomplished by this contractor for all required systems, equipment, and appurtenances, as required by the various standards and codes. The Owner's representative shall witness and sign off each item required. This contractor shall furnish required forms.

3..3 TESTS

A. Install all test pipes and valves as required by NFPA No. 13. Locate inspector's test valves and auxiliary drain valves above ceilings in areas approved by the Architect and provide hose bibb connections. Conduct all tests as required by NFPA Standards and Insurance Services Office and submit copies of completed test forms to the Owner.

B. All fire sprinkler related tests requiring the witnessing by local authorities will be the responsibility of this contractor. If tests are not run or do not have the proper witness or documentation, then they will be run late and all damage caused by the system, or caused in uncovering the system for such tests, will be borne by this contractor.

C. The local city Fire Marshall shall be notified (in writing) at least three days in advance of the following:

1. Hydrostatic test and final inspection of the underground, prior to backfilling.
2. Flushing of underground prior to connection to overhead.
3. Hydrostatic test and final inspection of overhead, prior to the installation of the ceilings.

3..4 GENERAL REQUIREMENTS

A. This contractor shall submit complete drawings, hydraulic calculations, and proper documentation to the local authority having jurisdiction and receive their approval before submitting such material to the Owner's representative for final approval. The contractor

will be required to show proof of submittal to the Owner's insurance underwriter and local building authorities before installation may begin.

B. All work of this contractor will be coordinated with other trades to insure minimal changes to the sprinkler system from the designs. Careful coordination of mechanical and electrical ducts, pipe and conduit shall be required. The ceiling cavity must be carefully reviewed and coordinated with all trades. In the event of conflict the installation of the mechanical equipment and piping shall be in the following order: plumbing waste, rainwater, and soil lines' supply, return, and exhaust ductwork; water piping; fire protection piping; and pneumatic control piping.

C. Every effort shall be required to insure that the heads form a symmetrical pattern in the ceiling with the ceiling grid, the lights, and diffusers and grilles and as shown on the Architect's reflected ceiling plan. Offsets shall be made in piping to accommodate ductwork in ceiling. Heads should be symmetrical and all piping run parallel or perpendicular to building lines. In no case shall sprinkler heads be installed closer than 6" from ceiling grids or closer than approved distances from ceiling obstructions.

D. All sprinkler piping shall be run concealed unless approved by the Owner's representative. All lines will be run as high as possible so as to not interfere with future changes to ceiling heights or other mechanical equipment. This contractor will be responsible for all sleeves, core drills, and sealing of penetrations in walls, floors, and structural members to facilitate the installation of the system; however, no holes in, or attachments to structural members will be allowed unless approved by the Owner's representative.

E. All required drains and test pipes will be installed and finished in a workmanlike manner, terminating at a proper location to accommodate the required outflow without damaging the building or landscaping. Drain and test pipe locations shall be approved by the Owner's representative.

F. All piping and heads located in un-heated spaces shall be installed with a glycol loop system. Coordinate location with the Owner's representative. Indicating valves with tamper switches shall be installed and wired as required by code. Coordinate with electrical contractor.

G. No piping or valve assemblies shall be run exposed in a finished area without the prior approval of the Owner's representative.

3..5 JOB CLOSEOUT

A. This contractor shall assure that all placards, signs, and instruction manuals are in place, and all tests are run before any consideration for final payment will be considered. This includes maintenance manuals, hydraulic calculations placards, spare head cabinets and the proper number of spare heads, and instruction to on-site personnel.

END OF SECTION 13900

DIVISION 14 - CONVEYING SYSTEMS

Not Applicable

DIVISION 15 - MECHANICAL

Section 15010	General Mechanical Requirements
Section 15060	Hangers and Supports
Section 15070	Mechanical Sound, Vibration and Seismic Control
Section 15075	Mechanical Identification
Section 15080	Mechanical Insulation
Section 15105	Pipes and Tubes
Section 15110	Valves
Section 15120	Piping Specialties
Section 15130	Pumps
Section 15140	Domestic Water Piping
Section 15150	Sanitary Waste and Vent Piping
Section 15160	Storm Drainage Piping
Section 15190	Fuel Piping
Section 15300	Fire Sprinklers & Piping
Section 15410	Plumbing Fixtures
Section 15480	Domestic Water Heaters
Section 15550	Breeching, Chimneys and Stacks
Section 15736	Packaged Rooftop Air Conditioning Units
Section 15760	Terminal Heating and Cooling Units
Section 15810	Ducts
Section 15820	Duct Accessories
Section 15830	Fans
Section 15850	Air Inlets and Outlets
Section 15950	Testing, Adjusting and Balancing

SECTION 15010

GENERAL MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and project conditions.

B. Products, product options and substitutions.

C. Closeout procedures.

D. Submittals.

E. Test and inspection.

F. Regulatory requirements.

G. Cutting and patching.

H. Special procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Provide all labor, materials and equipment necessary for completely finished and operational systems as described and specified.

C. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.

D. Coordinate space requirements, supports, and installation of mechanical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs. Provide incidental items such as offsets, fittings and accessories required for a completely operational mechanical system.

E. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean up of Work in preparation for Substantial Completion.

G. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal with Architect/Engineer accepted form.

B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

C. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.

D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.

E. Schedule submittals to expedite Project, and deliver to Architect/Engineer. Coordinate submission of related items.

F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.

G. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.

H. Allow space on submittals for Contractor and Architect/Engineer review stamps.

I. When revised for resubmission, identify changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

K. Submittals not requested will not be recognized or processed.

1.4 PROPOSED PRODUCTS LIST

A. Within 15 days after date of Owner-Contractor Agreement Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA

A. Product Data: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents. Provide copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes as described.

B. Submit number of copies Contractor requires, plus two copies Architect/Engineer will retain.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. After review distribute in accordance with Submittal Procedures article above and provide copies for record documents described.

1.6 SHOP DRAWINGS

A. Shop Drawings: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents. Produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01700.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.7 TEST REPORTS

A. Submit for Architect/Engineer's knowledge as contract administrator or for Owner.

B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.8 CERTIFICATES

A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or Contractor to Architect/Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

1.9 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect/Engineer for delivery to Owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.10 QUALITY CONTROL AND CONTROL OF INSTALLATION

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

B. Comply with manufacturer’s instructions, including each step in sequence.

C. When manufacturers’ instructions conflict with Contract Documents, request clarification form Architect/Engineer before proceeding.

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

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.

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

1.11 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturer's tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification form Architect/Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.12 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, complies with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard and all applicable codes, ordnances and regulations in effect, except where specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. When specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

E. Comply with the latest editions of the following:
   a. International Mechanical Code;
   b. International Plumbing Code;
   c. State Department of Health Standards;
   d. International Energy Code;
   e. International Fire Protection Code;
   f. International Building Code;
   g. International Electric Code;
   h. Utah State Boiler Code;
   i. Salt Lake County Health Department;
   j. Salt Lake County Wastewater Management Division;
   k. Salt Lake County Water Department;
   l. Salt Lake County Water Conservation Standards.

F. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.

1.13 PRODUCTS

A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.

C. Furnish interchangeable components from same manufacturer for components being replaced.

1.14 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's instruction.

B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.15 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

D. For exterior storage of fabricated products, place on sloped supports above ground.

E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

1.16 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: products of one of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

1.17 PRODUCT SUBSTITUTION PROCEDURES

A. Architect/Engineer will consider requests for Substitutions only within 15 days after date established in Notice to Proceed.

B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that Contractor:
1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
2. Will provide same warranty for Substitution as for specified product.
3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.

F. Substitution Submittal Procedure:
1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
3. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

1.18 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's review.

1.19 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.

C. Replace filters of operating equipment.

D. Clean debris from roofs, gutters, downspouts, and drainage systems.

E. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.20 STARTING OF SYTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect/Engineer seven days prior to start-up of each item.

C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable manufacturer's representative and Contractors' personnel in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

1.21 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. Demonstrate Project equipment and instruct by manufacturer's representative who is knowledgeable about the Project.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time agreed time, at designated location.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

1.22 TESTING, ADJUSTING AND BALANCING

A. Independent firm will perform services specified in Section 15950.

B. Reports will be submitted by independent firm to Architect/Engineer indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents.

1.23 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

1.24 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed Shop Drawings, Product Data, and Samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract drawings.

G. Submit documents to Architect/Engineer.

1.25 OPERATION AND MAINTENANCE DATA

A. Submit data bound in 8-1/2 x 11 inch (A4) text pages, three D side ring binders with durable plastic cloth covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instructions for equipment and systems.
      f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
   3. Part 3: Project documents and certificates, including the following:
      a. Shop drawings and product data.
      b. Air and water balance reports.
      c. Certificates.
      d. Photocopies of warranties and bonds.

1.26 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.

D. Submit three sets of revised final volumes in final form within 10 days after final inspection.

E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

F. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and special operating instructions.

G. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

H. Include servicing and lubrication schedule, and list of lubricants required.

I. Include manufacturer's printed operation and maintenance instructions.

J. Include sequence of operation by controls manufacturer.

K. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

L. Include control diagrams by controls manufacturer as installed.

M. Include Contractor's coordination drawings, with color-coded piping diagrams as installed.

N. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

O. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

P. Include test and balancing reports as specified in Section 15950.

Q. Additional Requirements: As specified in individual product specification sections.

R. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

1.27 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.

B. Deliver to Project site. Obtain receipt.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 15060

HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes pipe and equipment supports, hangers, anchors, bases sleeves and sealing of work to adjacent construction.

1.2 REFERENCES

A. ASME B31.9 (American Society of Mechanical Engineers) - Building Services Piping.

B. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

C. AWS D1.1 (American Welding Society) - Structural Welding Code.

D. MSS SP58 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Materials, Design and Manufacturer.

E. MSS SP69 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Selection and Application.

F. MSS SP89 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.

1.4 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. B-Line Fee and Mason Grinnell PH.D Michigan

B. General:
1. Hangers and accessories shall be sized with a safety factor of five (5) times the actual load.
2. Hangers for insulated piping shall be oversized to accommodate insulation thickness. Provide with insulation shields with inserts or insulation saddles as required in Section 15080 – Mechanical Insulation.
3. Copper clad hangers shall be used for copper piping systems. Provide heavy density mildew and moisture rot proof felt pad securely attached to the hanger or

5 mil thick polyvinyl chloride coating to prevent contact between the pipe and hanger.

C. Plumbing Piping – DWV:
1. Conform to ASME B31.9 ASTM F708.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (13 to 38 mm): Hot Dipped Galvanized, Carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 inches (50 mm) and Over: Hot Dipped Galvanized, Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Hot dipped galvanized, steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 inches (76 mm): Cast iron hook.
6. Wall Support for Pipe Sizes 4 inches (100 mm) and Over: Welded hot dipped galvanized steel bracket and wrought hot dipped galvanized steel clamp.
7. Vertical Support: Hot dipped galvanized steel riser clamp.
8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Copper-plated, Carbon-steel adjustable, ring.

D. Plumbing Piping – Water:
1. Conform to ASME B31.9 ASTM F708.
2. Hangers Pipe Sizes ½ to 1-1/2 inch (13 to 38 mm): Hot dipped galvanized, carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 inches (50 mm) and Over: Hot dipped galvanized, carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 to 4 inches (50 to 100 mm): Hot dipped galvanized, carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 inches (150 mm) and Over: Adjustable, Hot dipped galvanized, steel yoke, cast iron roll, double hanger.
6. Multiple or Trapeze Hangers: Hot dipped galvanized, steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches (150 mm) and Over: Hot dipped galvanized, steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall support for pipe sizes to 3 inches (76) mm): Cast iron hook.
9. Wall support for pipe sizes 4 inches (100 mm) and Over: Welded, hot dipped galvanized, steel bracket and wrought hot dipped galvanized steel clamp.
10. Wall support for hot pipe sizes 6 inches (150 mm) and Over: Welded hot dipped galvanized, steel bracket and wrought hot dipped galvanized, steel clamp with adjustable steel yoke and cast iron roll.
11. Vertical Support: Hot dipped galvanized, steel riser clamp.
12. Floor support for cold pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor support for hot pipe sizes to 4 inches (100 mm): Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor support for hot pipe sizes 6 inches (150 mm) and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or hot dipped galvanized steel support.
15. Copper Pipe Support: Copper-plated, Hot Dipped Galvanized, Carbon-steel ring.

E. Hydronic Piping:
1. Conform to ASME B31.9, ASTM F708.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (13 to 38 mm): Hot Dipped Galvanized, Carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 inches (50 mm) and Over: Hot Dipped Galvanized, Carbon steel, adjustable, clevis.

4. Hangers for Hot Pipe Sizes 2 to 4 inches (50 to 100 mm): Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 inches (150 mm) and Over: Adjustable, Hot dipped galvanized, steel yoke, cast iron roll, double hanger.
6. Multiple or Trapeze Hangers: Hot dipped galvanized, steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches (150 mm) and Over: Hot dipped galvanized, steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 inches (76 mm): Cast iron hooks.
9. Wall Support for Pipe Sizes 4 inches (100 mm) and Over: Welded, hot dipped galvanized, steel bracket and wrought hot dipped galvanized steel clamp.
10. Wall Support for Hot Pipe Sizes 6 inches (150 mm) and Over: Welded, hot dipped galvanized steel bracket and wrought, hot dipped galvanized, steel clamp with adjustable steel yoke and cast iron roll.
11. Vertical Support: Hot dipped galvanized steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or hot dipped galvanized steel support.
13. Floor Support for Hot Pipe Sizes to 4 Inches (100 mm): Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or hot dipped galvanized steel support.
14. Floor Support for Hot Pipe Sizes 6 inches (150 mm) and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or hot dipped galvanized steel support.
15. Copper Pipe Support: Copper-plated, carbon steel ring.

2.2 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.3 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Metal Counterflashing: 22 gage galvanized steel.

C. Lead Flashing:
1. Waterproofing: 5 lb./sq. ft (24.5 kg/sq m) sheet lead
2. Soundproofing: 1 lb./sq. ft (5 kg/sq m) sheet lead.

D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

E. Caps: Steel, 22 gage (0.8 mm) minimum; 16 gage (1.5 mm) at fire resistant elements.

2.5 EQUIPMENT CURBS

A. Fabrication: Welded 18 gage (1.2 mm) galvanized steel shell and base, mitered 3-inch cant, variable step to match roof insulation, 1-1/2 inch thick insulation, and factory installed wood nailer.

2.6 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage (1.2 mm) thick galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed Sleeves for Round Ductwork: Galvanized steel.

D. Sleeves for Rectangular Ductwork: Galvanized steel or wood.

E. Fire-Stopping Insulation: Glass fiber type, non-combustible.

PART 3 EXECUTION

3.1 INSTALLATION

3.2 INSERTS

A. Install inserts for placement in concrete forms.

B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.3 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers with minimum 1/2-inch (13 mm) space between finished covering and adjacent work.

C. Place hangers within 12 inches (300 mm) of each horizontal elbow.

D. Use hangers with 1-1/2 inch (38 mm) minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet (1.5 m) maximum spacing between hangers.

F. Support vertical piping at every [other] floor. Support vertical cast iron pipe at each floor at hub.

G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

3.4 EQUIPMENT BASES AND SUPPORTS

A. Provide reinforced concrete housekeeping pads, minimum 4 thick and extending 6 inches (150 mm) beyond supported equipment. Refer to Architectural Concrete Specifications.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of Steel pipe and fittings. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.5 FLASHING

A. Provide flexible flashing and metal Counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 3 inches (75 mm) minimum above finished roof surface with lead worked 1-inch (25 mm) minimum into hub, 8 inches (200 mm) minimum clear on sides with 24 x 24 inches (600 x 600 mm) sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash, and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches (250 mm) clear on sides with minimum 36 x 36 inch (910 x 910 mm) sheet size. Fasten flashing to drain clamp device.

D. Seal floor drains watertight to adjacent materials.

E. Provide acoustical sound control around ducts and pipes penetrating equipment rooms. Fill openings with fiberglass blanket and caulk each side of opening with non-hardening caulking compound.

F. Provide curbs for mechanical roof installations 14 inches minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach counter flashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.

G. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.6 SLEEVES

A. Set sleeves in position in forms. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

E. Install chrome plated steel escutcheons at finished surfaces.

3.7 SCHEDULES

PIPE SIZE	MAX. HANGER SPACING	DIAMETER
Inches	Feet	Inches
½ to 1 (12 to 32)	6	3/8
1-1/4 to 2	7	3/8
2-1/2 to 3	10	½
4	14	5/8
5	16	5/8
6	17	¾

PIPE SIZE	MAX. HANGER SPACING	DIAMETER
8	19	7/8
8 and over	20	1
PVC (All Sizes)	6	3/8

END OF SECTION

SECTION 15070

MECHANICAL SOUND, VIBRATION AND SEISMIC CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Section includes vibration isolation. Seismic anchorage for all isolated and non-isolated equipment, ductwork and piping systems furnished and installed under Division 15.

B. Related Sections:
1. Section 15060 – Hangers and Supports
2. Section 15120 – Piping Specialties: Product requirements for Supports, anchors and piping expansion compensation for placement by this section.
3. Section 15810 – Ducts
4. Section 15820 – Duct Accessories: Product requirements for both solid and flexible duct connectors for duct silencers specified for placement by this section.

1.2 PERFORMANCE REQUIREMENTS

A. Provide seismic anchorage and bracing for all equipment, ductwork and piping in accordance with seismic zone three (3) of the International Building Code.
1. Supports anchorage and bracing of all equipment, piping and ductwork, shall be designed by a professional engineer working for the restraint manufacturer and qualified with experiences in the seismic bracing of mechanical systems. The seismic engineer shall establish anchorage requirement specific to the equipment submitted, reviewed and accepted by the Architect/Engineer for the project.

2. Furnished equipment shall meet the requirements of the seismic codes with bases and supports designed to accommodate seismic support.

B. Provide vibration isolation on motor driven equipment over 0.5 hp (0.35 kW), plus connected piping and ductwork.

C. Provide minimum static deflection of isolators for equipment as follows:
1. Slab on Grade, Under 20 hp (15 kW)
   a. Under 400 rpm: Rubber Floor Isolator or Hanger
   b. 400 – 600 rpm: 1 inch (25 mm)
   c. 600 - 800 rpm: 0.5 inch (12 mm)
   d. 800 - 900 rpm: 0.2 inch (5 mm)
   e. 1100 - 1500 rpm: 0.14 inch (4 mm)
   f. Over 1500 rpm: 0.1 inch (3 mm)
2. Slab on Grade, Over 20 hp (15 kW)
   a. Under 400 rpm: Rubber Floor Isolators or Hangers
   b. 400 - 600 rpm: 2 inch (50 mm)
   c. 600 - 800 rpm: 1 inch (25 mm)
   d. 800 - 900 rpm: 0.5 inch (12 mm)
   e. 1100 - 1500 rpm: 0.2 inch (5 mm)
   f. Over 1500 rpm: 0.15 inch (4 mm)
3. Upper Floors, Normal
   a. Under 400 rpm: Rubber Floor Isolators or Hangers
   b. 400 - 600 rpm: 3.5 inch (90 mm)
   c. 600 - 800 rpm: 2 inch (50 mm)
   d. 800 - 900 rpm: 1 inch (25 mm)

e. 1100 - 1500 rpm: 0.5 inch (12 mm)
f. Over 1500 rpm: 0.2 inch (5 mm)

D. Maintain sound level of spaces at levels not to exceed those listed below by utilizing acoustical devices.

E. Maintain rooms at following maximum sound levels, in Noise Criteria (NC) as defined by ASHRAE Handbook. Private Residences

1. Offices

a.	Executive	30
b.	Conference rooms	30
c.	Private Offices	35
d.	Open-plan areas	35
e.	Computer/business machine areas	45
f.	Public circulation, retail	40

1.3 SUBMITTALS

A. Submit shop drawings calculations and product data in accordance with the general provisions of the specifications.

B. Shop Drawings: Indicate inertia bases and locate vibration isolators, with static and dynamic load on each. Indicate assembly, materials, thickness, dimensional data, pressure losses, acoustical performance, layout, and connection details for sound attenuation products fabricated for this project.

C. Product Data: Submit schedule of vibration isolator type with location and load on each. Submit catalog information indicating, materials and dimensional data.

D. Design Data: Submit calculations for seismic and vibration requirements for all equipment to be restrained and isolated. Drawings and calculations submitted for seismic bracing and anchors shall bear the engineer's signed professional seal.

E. Manufacturer's Installation Instructions: Submit special procedures and setting dimensions. Indicate installation requirements maintaining integrity of sound isolation.

F. Manufacturer's Certificate: Certify isolators meet or exceed specified requirements.

G. Manufacturer's Field Reports: Indicate sound isolation and seismic restraint installation is complete and in accordance with instructions.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Uniform Building Code (UBC), Smagna Seismic Restraint Manual, AMCA 300 ANSI S1.13 ARI 575 ASA 16 ANSI S1.36 standards and recommendations of ASHRAE 68.

B. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

C. Design application of seismic restraint systems under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Utah.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATORS

A. Open Spring Isolators:
1. Spring Isolators:
a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
b. Code: Color code springs for load carrying capacity.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
3. Spring Mounts: Furnish with leveling devices, minimum 0.25-inch (6 mm) thick neoprene sound pads, and zinc chromate plated hardware.
4. Sound Pads: Size for minimum deflection of 0.05 inch (1.2 mm); meet requirements for neoprene pad isolators.

B. Restrained Spring Isolators:
1. Spring Isolators:
a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
b. Code: Color code springs for load carrying capacity.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
3. Spring Mounts: Furnish with leveling devices, minimum 0.25-inch (6 mm) thick neoprene sound pads, and zinc chromate plated hardware.
4. Sound Pads: Size for minimum deflection of 0.05 inch (1.2 mm); meet requirements for neoprene pad isolators.
5. Restraint: Furnish mounting frame and limit stops.

C. Closed Spring Isolators:
1. Spring Isolators:
a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
b. Code: Color code springs for load carrying capacity.
2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25-inch (7 mm) clearance.

D. Restrained Closed Spring Isolators:
1. Spring Isolators:
a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
b. Code: Color code springs for load carrying capacity.
2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.

3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25-inch (7 mm) clearance and limit stops.

E. Spring Hanger:
1. Spring Isolators:
   a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
   b. Code: Color code springs for load carrying capacity.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
3. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators.
4. Misalignment: Capable of 20 degree hanger rod misalignment.

F. Neoprene Pad Isolators:
1. Rubber or neoprene-waffle pads.
   a. 30 durometer.
   b. Minimum 1/2 inch (13 mm) thick.
   c. Maximum loading 40 psi (275 kPa).
   d. Height of ribs: not to exceed 0.7 times width.
2. Configuration: 1/2-inch (13 mm) thick waffle pads bonded each side of 1/4-inch (6 mm) thick steel plate.

G. Rubber Mount or Hanger: Molded rubber designed for 0.5 inches (13 mm) deflection with threaded insert.

H. Glass Fiber Pads: Neoprene jacketed pre-compressed molded glass fiber.

I. Seismic Snubbers:
1. Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.
2. Neoprene Elements: Replaceable, minimum of 0.75 inch (18 mm) thick.
3. Capacity: 4 times load assigned to mount groupings at 0.4-inch (10 mm) deflection.
4. Attachment Points and Fasteners: Capable of withstanding 3 times rated load capacity of seismic snubber.

PART 3 EXECUTION

3.1 EXAMINATION

3.2 EXISTING WORK

A. Provide access to existing piping and ductwork and other installations remaining active and requiring access.

B. Extend existing piping and ductwork installations using materials and methods.

3.3 INSTALLATION

A. Install isolation for motor driven equipment.
1. Bases:

2. Set steel bases for 1-inch (25 mm) clearance between housekeeping pad and base.
3. Set concrete inertia bases for 2-inch (50 mm) clearance between housekeeping pad and base.
4. Adjust equipment level.

B. Install spring hangers without binding.

C. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

D. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

E. Provide resiliently mounted equipment, piping, and ductwork with seismic snubbers. Provide each inertia base with minimum of four seismic snubbers located close to isolators. Snub equipment designated for post disaster use to 0.05-inch (1.5 mm) maximum clearance. Provide other snubbers with clearance between 0.15 inch (4 mm) and 0.25 inch (7 mm).

F. Support piping connections to isolated equipment resiliently as follows:
1. Up to 4 inch (100 mm) Diameter: First three points of support.
2. 5 to 8 inch (125 to 200 mm) Diameter: First four points of support.
3. 10 inch (250 mm) Diameter and Over: First six points of support.
4. Select three hangers closest to vibration source for minimum 1.0-inch (25 mm) static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0-inch (25 mm) static deflection or 1/2 static deflection of isolated equipment.

G. Connect wiring to isolated equipment with flexible hanging loop.

3.4 FIELD QUALITY CONTROL

A. Quality Requirements: Testing, adjusting, and balancing].

B. Inspect isolated equipment after installation and submit report. Include static deflections.

C. After start-up, final corrections and balancing of systems take octave band sound measurements over full audio frequency range in areas adjacent to mechanical equipment rooms, duct and pipe shafts, and other critical locations. Provide one-third octave band measurements of artificial sound sources in areas indicated as having critical requirements. Submit complete report of test results including sound curves.

PIPE ISOLATION SCHEDULE

Pipe Size Inch (mm)	Isolated Distance from Equipment
1 (25)	120 diameters (3.0 m)
2 (50)	90 diameters (4.5 m)
3 (80)	80 diameters (6.0 m)
4 (100)	75 diameters (7.5 m)
6 (150)	60 diameters (9.0 m)

EQUIPMENT ISOLATION SCHEDULE

ISOLATED EQUIPMENT	BASE TYPE THICKNESS	ISOLATOR TYPE DEFLECTION
HVAC Pumps		
Air Cooled Condensing Units		

END OF SECTION

SECTION 15075

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes nameplates, tags, stencils and pipe markers.

1.2 REFERENCES

A. ASME A13.1 (American Society of Mechanical Engineers) - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with the General Conditions of the Contract.

B. Product Data: Submit manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.1 NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved letters in contrasting background color.

2.2 TAGS

1. Brass with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges. Provide with brass chains for installation.

B. Information Tags:
1. Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches (83 x 143 mm) with grommet and self-locking nylon ties.

C. Tag Chart: Typewritten letter size list of applied tags and location plastic laminated.

2.3 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
1. Up to 1 1/4 inches Outside Diameter of Insulation or Pipe: 1/2-inch-high letters.
2. 1-1/2 to 2 inches outside diameter of insulation of pipe: ¾ inch high letters.
3. 2-1/2 to 6 inches Outside Diameter of Insulation or Pipe: 1 1/4-inch high letters.
4. Outside Diameter of Insulation or Pipe: 2 1/2 inches high letters.
5. Over 10 inches outside diameter of pipe or insulation: 3-1/2 inch high letters.
6. Ductwork and Equipment: 2-1/2 inches high letters.

B. Stencil Paint: As specified in Architectural Painting Specifications, semi-gloss enamel, colors and lettering size conform to ASME A13.1.

2.4 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

B. Plastic Pipe Markers:
1. Manufacturer:
a. Set mark type snap-around markers.
2. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers:
1. Manufacturer:
a. Brady Type 350.
2. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings, with legend, size and color-coding.

2.5 CEILING TACKS

A. Description: Steel with 3/4-inch (19 mm) diameter color-coded head.

B. Color code as follows:
1. HVAC equipment: Yellow.
2. Fire dampers/smoke dampers: Red.
3. Plumbing valves: Green.
4. Heating/cooling valves: Blue.

2.6 LABELS

A. Description: Laminated Mylar, size 1.9 x 0.75 inches, adhesive backed with printed identification.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Architectural Painting Specifications for stencil painting.

3.2 INSTALLATION

A. Apply stencil painting in accordance with Architectural Painting Specifications.

B. Install identifying devices after completion of coverings and painting.

C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

D. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.

E. Install tags using corrosion resistant chain. Number tags consecutively by location.

F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Identify in-line pumps and other small devices with tags.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Identify valves in main and branch piping with tags.

I. Identify air terminal units and radiator valves with numbered tags.

J. Tag automatic controls, instruments, and relays. Key to control schematic.

K. Identify piping, concealed or exposed, with plastic pipe markers, plastic tape pipe markers or stenciled painting. Use tags on piping 3/4 inch (20 mm) diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

L. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

3.3 SCHEDULES

IDENTIFICATION

1. Domestic Cold Water Piping.
   a. Background Color: Green

2. Domestic Hot Water.
   a. Background Color: Yellow

3. Hot water heating.
   a. Background Color: Yellow
   b. With Directional Arrow.

4. Natural Gas.
   a. Background Color: Orange

5. Fire Protection Red

END OF SECTION

SECTION 15080

MECHANICAL INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes ductwork insulation, duct liner, insulation jackets, covering, and thermal insulation for piping systems including vapor retarders, jackets and accessories.

B. Related Sections:
1. Section 15060 – Hangers and Supports: Execution requirements for inserts for placement by this section.
2. Section 15075 – Mechanical Identification: Product requirements for mechanical identification for placement by this section.

1.2 REFERENCES

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

C. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

D. ASTM C518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

E. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

F. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

G. ASTM C547 - Standard Specification for Mineral Fiber Preformed Pipe Insulation.

H. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.

I. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

J. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyurethane Thermal Insulation.

K. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).

L. ASTM C610 - Standard Specification for Expanded Perlite Block and Pipe Thermal Insulation.

M. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

N. ASTM C1071 - Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).

O. ASTM C1126- Standard Specification for Preformed Closed Cell Phenolic Foam Pipe and Board Insulation.

P. ASTM C1136 – Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

Q. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

R. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

S. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

T. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

U. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

V. NAIMA (North American Insulation Manufacturers Association) - National Insulation Standards.

W. SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards - Metal and Flexible.

1.3 SUBMITTALS

A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location, as per the general conditions of the contract.

B. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Applicator: Company specializing in performing Work of this section with minimum three years experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

B. Maintain temperature during and after installation for minimum period of 24 hours.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Certain-Teed

Owens-Corning

Johns-Manville

Armstrong

Knauf

Dow Chemical

2.2 GLASS MINERAL FIBER, FLEXIBLE BLANKET DUCT WRAP

A. Insulation: Glass Fiber Blanket Thermal Insulation for Commercial and Industrial Applications. 1 ½" thick .075 pounds per cubic foot with a thermal conductivity of .24 at 75 degrees F.

B. Vapor Retarder Jacket: ASTM 1136, Type II Flexible and Low Permeance Vapor Retarders for Thermal Insulation. Perm rating shall not exceed .24 when tested in accordance with ASTM E96, Procedure A.

C. Manufacturers:
1. Manufacturers:

Certain-Teed

Owens-Corning

Johns-Manville

Armstrong

Knauf

Dow Chemical

2. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Indoor Vapor Retarder Finish:
   1. Manufacturers:

      Certain-Teed

      Owens-Corning

      Johns-Manville

      Armstrong

      Knauf

      Dow Chemical

2.3 CELLULAR GLASS PIPE INSULATION

A. Insulation: ASTM C552, Type II – pipe and tubing insulation, Class 2 - Jacketed.
   1. 'K' ('ksi') factor: ASTM C177 or ASTM C518, 0.25at 75 degrees F.

B. Vapor retarder jacket: Perm rating shall not exceed 0.25 when tested in accordance with ASTM E96, Procedure A.

2.4 PROTECTIVE INSULATION JACKET (PIPE INSULATION EXPOSED TO WEATHER)

A. Aluminum Jacket: ASTM B209.
   1. Thickness: 0.016-inch thick sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2-inch (50 mm) laps.
   4. Fittings: 0.016-inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015-inch thick aluminum.

2.5 GLASS FIBER DUCT LINER, FLEXIBLE Insulation for Interior of sheet metal ducts.

A. Insulation: ASTM C1071 Thermal and Acoustical Insulation Glass Fiber, Duct Lining Material, Type I

B. Adhesive:
   1. Waterproof, ASTM E162 fire-retardant type.

C. Liner Fasteners: Galvanized steel, welded with integral head.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify piping, equipment and ductwork has been tested before applying insulation materials.

B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with NAIMA National Insulation Standards.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

D. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

E. Inserts and Shields:
   1. Application: Piping or Equipment 1-1/2 inches diameter or larger.
   2. Shields: Steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under finish jacket.
   4. Insert configuration: Minimum 6 inches (150 mm) long, of thickness and contour matching adjoining insulation; may be factory fabricated.
   5. Insert material: Compression resistant insulating material suitable for planned temperature range and service.

F. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07840 for penetrations of assemblies with fire resistance rating greater than one hour.

G. Exterior Applications: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with stainless steel jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal equipment.

H. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

I. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

J. Glass fiber insulated equipment-containing fluids above ambient temperature: Provide standard jackets, with or without vapor retarder, factory-applied or field-applied. Finish with glass cloth and adhesive.

K. Finish insulation at supports, protrusions, and interruptions.

L. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

M. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

N. Insulated ductwork conveying air below ambient temperature:
   1. Provide insulation with vapor retarder jackets.

2. Finish with tape and vapor retarder jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

O. Duct Liner Application:
1. Adhere insulation with adhesive for 100 percent coverage.
2. Secure insulation with mechanical liner fasteners. SMACNA Standards for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

A. Plumbing Systems:
1. Domestic Hot Water Supply and Recalculation Systems:
   a. Insulate entire system with fiberglass pipe covering with all service jacket and self-seal lap. Insulation thickness as follows: pipe size up to 1 inch – ¾" thick pipe size 1 l/4" to 6" – 1" thick.
2. Domestic Cold Water:
   a. Horizontal mains: ¾" thick fiberglass pipe covering with all service jacket and self-seal lap.
3. Primary Roof Drains:
   a. Horizontal mains and vertical to and including drain bowls with ¾" thick fiberglass pipe covering with all service jacket and self-seal lap.
   b. Bowls of secondary roof drains shall be insulated with ¾" thick foil scrim face.
4. Fittings:
   a. Pre-molded PVC fitting covers with fiberglass insert. In return air plenums use insulating cement finished with 6-ounce canvas and heavy coat of vapor barrier mastic coating.

B. Heating System (Supply and Return Piping)
1. Fiberglass pipe conversing with all-service jacket and self-seal lap.
2. Thickness as follows: pipe size and run outs 1" and less: ¾" thick; 1 ¼" and larger 1 ½" thick.
3.

C. Air Distribution System:
1. Supply ductwork (not indicated to be lined): 1 ½" thick .75 pound fiberglass duct wrap with foil scrim facing. Seal all joints. Apply with adhesive or wire at 18" o.c.
2. Lined supply ductwork.
   a. Insulate with 1" duct liner with continuous sheet metal edge protector at entering and leaving edges.
   b. Coat transverse joints prior to installation.
   c. Line ductwork in rectangular ductwork downstream of VAV or fan terminal boxes, upstream of toilet exhaust fans a minimum distance of 10'-0", transfer air ducts and supply plenums above air devices.
   d. Pipe insulation exposed to weather.

D. Provide aluminum jacket and fitting covers on all piping exposed to weather

END OF SECTION

SECTION 15105

PIPES AND TUBES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes pipe and pipe fittings.

B. Related Sections:
1. Section 09900 - Paints and Coatings: Product requirements Painting for placement by this section.
2. Section 15070 – Mechanical Sound, Vibration, and Seismic Control: Product requirements for Vibration Isolation for placement by this section.
3. Section 15080 - Mechanical Insulation: Product requirements for Piping Insulation for placement by this section.

1.2 REFERENCES

A. ASME (American Society of Mechanical Engineers) - Boiler and Pressure Vessel Codes, SEC IX - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.

B. ASME B16.3 (American Society of Mechanical Engineers) - Malleable Iron Threaded Fittings Class 50 and 300

C. ASME B16.18 (American Society of Mechanical Engineers) - Cast Copper Alloy Solder Joint Pressure Fittings.

D. ASME B16.22 (American Society of Mechanical Engineers) - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

E. ASME B31.9 (American Society of Mechanical Engineers) - Building Services Piping.

F. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

G. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

H. ASTM B32 - Solder Metal.

I. ASTM B88 - Seamless Copper Water Tube.

J. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration

K. AWS A5.8 (American Welding Society) - Brazing Filler Metal.

L. AWWA C105 (American Water Works Association) - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.

M. AWWA C110 (American Water Works Association) - Ductile - Iron and Grey -Iron Fittings 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.

N. AWWA C111 (American Water Works Association) - Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.

1.3 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, provide compatible system components and joints. Provide flanges, union, and couplings at locations requiring servicing.

B. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

C. Provide pipe hangers and supports in accordance with ASME B31.1, ASME B31.9 unless indicated otherwise.

D. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate schematic layout of refrigeration system, including equipment, critical dimensions, and sizes.

C. Product Data: Submit data on pipe materials and fittings. Submit manufacturers catalog information.

D. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.1, ASME B31.9 code for installation of piping systems and ASME SEC IX for welding materials and procedures.

B. Perform Work in accordance with applicable authority AWS D1.1 for welding hanger and support attachments to building structure.

C. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Product storage and handling requirements.

B. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system Protect

D. Maintain charge of refrigeration components until installation in piping system.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Product Requirements.

B. Do not install underground piping when bedding is wet or frozen.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 MAINTENANCE MATERIALS

A. Section 01700 - Execution Requirements: Spare parts and maintenance products.

PART 2 PRODUCTS

2.1 STEAM PIPING

A. Steel Pipe: ASTM A53, Schedule 40, [0.375 inch (10 mm) wall for sizes 12 inch (300 mm) and over,] black.
1. Fittings: ASTM B16.3, malleable iron or ASTM A234, forged steel welding type fittings.
2. Joints: Threaded, or welded.

2.2 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53, Schedule 40 galvanized.
1. Fittings: Galvanized cast iron, or ASTM B16.3 malleable iron.
2. Joints: Threaded, or grooved mechanical couplings.

2.3 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 inches (50 mm) and Under:
1. Ferrous Piping: 150 psig (1034 kPa) malleable iron, threaded.

B. Flanges for Pipe Over 2 inches (50 mm):
1. Ferrous Piping: 150 psig (1034 kPa) forged steel, slip-on.
2. Gaskets: 1/16-inch (1.6 mm) thick preformed neoprene.

C. Grooved and Shouldered Pipe End Couplings:
1. Housing Clamps: Malleable iron to engage and lock designed to permit some angular deflection, contraction, and expansion.
2. Sealing Gasket: C-shape elastomer composition for operating temperature range from –30 degrees F 230 degrees F.
3. Accessories: Steel bolts, nuts, and washers.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.

2.4 PIPE HANGERS AND SUPPORTS

A. Conform to ASME B31.1, B31.5, and 31.9, ASTM F708.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (13 to 38 mm): Malleable iron, adjustable swivel, and split ring.

C. Hangers for Cold Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

D. Hangers for Hot Pipe Sizes 2 to 4 inches (50 to 100 mm): Carbon steel, adjustable, clevis.

E. Hangers for Hot Pipe Sizes 6 inches (150 mm) and Over: Adjustable steel yoke, cast iron roll, double hanger.

F. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

G. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches (150 mm) and Over: Steel channels with welded spacers and hanger rods, cast iron roll.

H. Wall Support for Pipe Sizes to 3 inches (76 mm): Cast iron hooks.

I. Wall Support for Pipe Sizes 4 inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.

J. Wall Support for Hot Pipe Sizes 6 inches (150 mm) and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

K. Vertical Support: Steel riser clamp.

L. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

M. Floor Support for Hot Pipe Sizes to 4 inches (100 mm): Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

N. Floor Support for Hot Pipe Sizes 6 inches (150 mm) and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

O. Copper Pipe Support: Carbon steel rings, adjustable, copper plated.

P. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

Q. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION

A. Install glycol, piping in accordance with ASME B31.9. Install heating water piping in accordance with ASME B31.1, B31.9.

B. Install Work in accordance with State & Municipality standards.

C. Route piping parallel to building structure and maintain gradient.

D. Install piping to conserve building space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipe passing through partitions, walls and floors.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 15180.

H. Inserts:
1. Provide inserts for placement in concrete forms.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

I. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.1, ASME B31.9, and ASTM F708.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2-inch (13 mm) space between finished covering and adjacent work.
4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
5. Use hangers with 1-1/2 inch (38 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
7. Where piping is installed in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping, sheet lead packing between hanger and piping.
9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

J. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 15080.

K. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with general contractor.

L. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
   1. Slope steam piping one inch in 40 feet (0.25 percent) in direction of flow. Use eccentric reducers to maintain bottom of pipe level.

M. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

N. Prepare unfinished pipe, fittings and supports ready for finish painting.

O. Insulate piping and equipment; refer to Section 15080.

END OF SECTION

SECTION 15110

VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes valves for building services piping.

1.2 REFERENCES

A. AGA Z21.22 (American Gas Association) - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.

B. ASME B16.3 (American Society of Mechanical Engineers) - Malleable Iron Threaded Fittings.

C. AWS (American Welding Society) - Welding and Brazing Qualifications.

D. MSS SP-67 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Butterfly Valves.

E. MSS SP-71 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Swing Check Valves, Flanged and Threaded Ends.

F. MSS SP-78 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Plug Valves, Flanged and Threaded Ends.

G. MSS SP-80 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Bronze Gate, Globe, Angle and Check Valves.

H. MSS SP-85 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends.

I. MSS SP-110 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 SUBMITTALS

A. Submit product data in accordance with the General Conditions of the Contract.

B. Product Data: Submit Manufacturers catalog information with valve data and ratings for each service.

C. Welders Certificate: Include welder’s certification of compliance with ASME SEC IX, AWS D1.1.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit installation instructions, spare parts lists, exploded assembly views.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

PART 2 PRODUCTS

2.1 PLUMBING VALVES

2.2 GATE VALVES

A. Acceptable manufacturers:
1. Bronze and Iron Body Valves: Jenkins, Powell, Stockham, Lunkenheimer, Milwaukee, Red-White, Walworth, Crane, Grinnell, and Nibco.
2. Ball Valves: James Bury, Worcester, Jenkins, Milwaukee, Apollo, Powell, and Nibco.
3. Butterfly Valves: Centerline, DeZurik, Fisher, Victaulic, Keystone, Grinnell, and Flowseal.
4. Gas Cock: Peter, Healy or Crane.
5. Lubricated Plug Valves: Homestead, Nordstrom, Powell, and Wallworth.

B. Up To and Including 3 inches (80 mm): MSS SP-80, Class 125, bronze body, bronze trim, rising stem, hand-wheel, inside screw, solid wedge disc, solder or threaded ends.

C. 2 inches (50 mm) and Larger: MSS SP-70, Class 125, iron body, bronze trim, outside screw and yoke, hand-wheel, solid wedge disc, flanged ends. Furnish chain-wheel operators for valves 6 inches (150 mm) and larger mounted over 8 feet (2400 mm) above floor.

2.3 GLOBE VALVES

A. Up To and Including 3 inches (80 mm): MSS SP-80, Class 125, bronze body, bronze trim, hand-wheel, bronze disc, solder or threaded ends.

B. 2 inches (50 mm) and Larger: MSS SP-85, Class 125, iron body, bronze trim, hand-wheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Furnish chain-wheel operators for valves 6 inches (150 mm) and larger mounted over 8 feet (2400 mm) above floor.

2.4 BALL VALVES

A. Construction, 4 inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends.

2.5 PLUG VALVES

A. Construction 2-1/2 inches (65 mm) and Larger: MSS SP-78, 175 psi CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Furnish lever operator with setscrew.

2.6 BUTTERFLY VALVES

A. Construction 1-1/2 inches (40 mm) and Larger: MSS SP-67, 200 psi (1380 kPa) CWP, cast or ductile iron body. Nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, infinite position lever handle with memory stop. Furnish gear operators for valves 8 inches (150 mm) and larger, and chain-wheel operators for valves mounted over 8 feet (2400 mm) above floor.

2.7 SWING CHECK VALVES

A. Up To and Including 3 inches (80 mm):

1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder or threaded ends.

B. 2 inches (50 mm) and Larger:
1. MSS SP-71, Class 12, iron body, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

2.8 SPRING LOADED CHECK VALVES

A. Construction: Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

2.9 WATER PRESSURE REDUCING VALVES

A. Up to 2 inches (50 mm):
1. Construction: MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded ends.

B. Over 2 inches (50 mm):
1. Construction: MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.10 RELIEF VALVES

1. Construction: AGA Z21.22 certified, bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated.
2. Construction: AGA Z21.22 certified, bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F (98.9 degrees C), capacity ASME SEC IV certified and labeled.

2.11 GATE VALVES

A. Acceptable manufacturers:
1. Bronze and Iron Body Valves: Jenkins, Powell, Stockham, Lunkenheimer, Milwaukee, Red-White, Walworth, Crane, Grinnell, and Nibco.
2. Ball Valves: James Bury, Worcester, Jenkins, Milwaukee, Apollo, Powell, and Nibco.
3. Butterfly Valves: Centerline, DeZurik, Fisher, Victaulic, Keystone, Grinnell, and Flowseal.
4. Gas Cock: Peter, Healy or Crane.
5. Lubricated Plug Valves: Homestead, Nordstrom, Powell, and Wallworth.

6. Construction: Bronze body, bronze trim, union bonnet, rising stem, hand-wheel, inside screw, solid wedge disc, solder or threaded ends.

B. Over 2 inches (50 mm):
1. Construction: Iron body, bronze trim, bolted bonnet, rising stem, hand-wheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged or grooved ends.

2.12 GLOBE OR ANGLE VALVES

1. Construction: Bronze body, bronze trim, union bonnet, rising stem and hand-wheel, inside screw with renewable composition disc and bronze seat, solder or threaded ends.

B. Over 2 inches (50 mm):
1. Construction: Iron body, bronze trim, bolted bonnet, rising stem, hand-wheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, flanged ends.

2.13 BALL VALVES

1. Construction: Bronze, two piece body, stainless steel ball, Teflon seats and stuffing box ring, lever handle with balancing stops, solder or threaded ends.

2.14 PLUG VALVES

1. Construction: Bronze body, bronze tapered plug, full port opening, non-lubricated, Teflon packing, threaded ends.
2. Operator: One plug valve wrench for every ten plug-valves with minimum of one wrench.

B. Over 2 inches (50 mm):
1. Construction: Cast iron body and plug, full port opening, pressure lubricated, Teflon packing, flanged ends.
2. Operator: Each plug valve with wrench with setscrew.

2.15 BUTTERFLY VALVES

A. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer or lug ends, extended neck.

B. Disc: Aluminum bronze.

C. Operator: Infinite position lever handle with memory stop.

2.16 SWING CHECK VALVES

A. Under 2 inches:
1. Construction: Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder or threaded ends.

B. Over 2 inches:
1. Construction: Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends.

2.17 SPRING LOADED CHECK VALVES

A. Construction: Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer or threaded lug ends.

2.18 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe 2 inches (50 mm) and Under:
1. Ferrous Piping: 150 psig (1034 kPa) malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe Over 2 inches (50 mm):
1. Ferrous Piping: 150 psig (1034 kPa) forged steel, slip-on.
2. Copper Piping: Bronze.

C. Gaskets: 1/16-inch (1.6 mm) thick preformed neoprene.

D. Grooved and Shouldered Pipe End Couplings:
1. Housing Clamps: Malleable iron [galvanized] to engage and lock designed to permit some angular deflection, contraction, and expansion.
2. Sealing Gasket: C-shape elastomer composition for operating temperature range from 30 degrees F to 230 degrees F.

E. Accessories: Steel bolts, nuts, and washers.

F. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify Piping System is ready for installation.

3.2 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

B. Install valves with stems upright or horizontal, not inverted.

C. Use grooved mechanical couplings and fasteners only in accessible locations.

D. Install unions downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

E. Install ball or butterfly valves for shut-off and to isolate each piece of equipment, part of systems, or vertical risers.

F. Install globe, ball or butterfly valves for throttling, bypass, or manual flow control services.

G. Provide spring loaded check valves on discharge of water pumps.

H. Provide plug valves in natural gas systems for shut-off service.

I. Provide flow controls in water re-circulating systems as indicated on Drawings.

J. Use lug end butterfly valves to isolate equipment.

K. Use 3/4-inch (20 mm) ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

L. Provide check valve for backflow prevention.

M. Provide access means for each valve. Coordinate access means with General Contractor.

N. Provide isolation valve at each branch take-off serving two or more fixtures or items of equipment.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Conform to applicable piping specification for hangers and insulation.

END OF SECTION

SECTION 15120

PIPING SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes pressure gages and pressure gage taps, thermometers and thermometer wells, static pressure gages, filter gages. Section also includes, expansion tanks, air vents, air separators, strainers, pump suction fittings, combination fittings, flow indicators, controls, meters.

1.2 REFERENCES

A. ASME (American Society of Mechanical Engineers) - Boiler and Pressure Vessel Codes, SEC VIII-D - Rules for Construction of Pressure Vessels.

B. ASME B40.1 (American Society of Mechanical Engineers) - Gauges - Pressure Indicating Dial Type - Elastic Element.

C. ASTM E1 - Standard Specification for ASTM Thermometers.

D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

E. ASTM A105 - Forgings, Carbon Steel, for Piping Components.

F. ASTM A126 - Grey Iron Castings for Valves, Flanges, and Pipe Fittings.

G. ASTM A216 - Steel Casings, Carbon, Suitable for Fusion Welding, for High Temperature Service.

H. ASTM A395 - Ferric Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

1.3 SUBMITTALS

A. Product Data: Submit for manufactured products and assemblies used in this Project as per the General Conditions of this Contract.
   1. Manufacturer’s data indicating use, operating range, total range, accuracy, and location for manufactured components.
   2. Submit product description, model, dimensions, component sizes, service sizes, and finishes.
   3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each specialty.
   4. Submit electrical characteristics and connection requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of actual locations of components and instrumentation, flow controls flow meters.

C. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction, and replacement parts list as per the General Conditions of the Contract.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Protect systems from entry of foreign materials by temporary covers, caps and closures, completing sections of the work, and isolating parts of completed system until installation.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

1.7 FIELD MEASUREMENTS

A. Verify field measurements before fabrication.

1.8 MAINTENANCE SERVICE

A. Section 01700 - Execution Requirements: Maintenance service.

B. Furnish bi-annual visit for one year starting from Date of Substantial Completion to make glycol fluid concentration analysis on site with refractive index measurement instrument. Detail findings with maintenance personnel in writing of corrective actions needed including analysis and amounts of glycol or water added.

1.9 EXTRA MATERIALS

A. Provide sufficient inhibited propylene glycol to maintain specified concentrations for the one-year warranty period.

PART 2 PRODUCTS

2.1 PRESSURE GAGES

A. Gage: ASME B40.1, with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
   1. Case: Cast Aluminum.
   2. Bourdon Tube: Brass.
   3. Dial Size: 4-1/2 inch (114 mm).
   4. Mid-Scale Accuracy: One.
   5. Scale: Both psi and kPa.

2.2 PRESSURE GAGE TAPS

A. Needle Valve:
   1. Brass, 1/4 inch (6 mm) NPT for minimum 300 psi (2070 kPa).

B. Ball Valve:

1. Brass, 1/4 inch (6 mm) NPT for 250 psi (1720 kPa).

2.3 STEM TYPE THERMOMETERS

A. Manufacturers: Terice Industrial Series, Ameter Industrial Series.

B. Thermometer: ASTM E1, adjustable angle, red appearing mercury, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device.
1. Size: 9-inch (229 mm) scale.
2. Window: Clear.
3. Stem: Brass.
4. Accuracy: 2 percent.
5. Calibration: Both degrees F and degrees C.

2.4 TEST PLUGS

A. Manufacturers: Teriece, Fairfax, Peterson Equipment.

B. 1/4 inch (6 mm) NPT or 1/2 inch (13 mm) NPT brass fitting and cap for receiving 1/8 inch (3 mm) outside diameter pressure or temperature probe with:
1. Neoprene core for temperatures up to 200 degrees F (93 degrees C).
2. Nordel core for temperatures up to 350 degrees F (176 degrees C).
3. Viton core for temperatures up to 400 degrees F (204 degrees C).
4. Extension for insulated pipe.

2.5 DIAPHRAGM-TYPE EXPANSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with ASME SEC 8-D; supplied with National Board Form U-1, rated for working pressure of 125 psig (860 kPa), with flexible EPDM diaphragm sealed into tank, and steel support stand.

B. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to 12 psig

C. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure back flow prevention device, test cocks, strainer, vacuum breaker, and by-pass valves.

D. Size: As Scheduled on the Drawings.

2.6 AIR VENTS

A. Manual Type: Short vertical sections of 2-inch (50 mm) diameter pipe to form air chamber, with 1/8-inch (3 mm) brass needle valve at top of chamber.

B. Float Type:
1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

2.7 AIR SEPARATORS

A. Manufacturers: Bell and Crossett, Amtrol, Amstrong, Taco.

B. Dip Tube Fitting:
1. For 125 psig (860 kPa) operating pressure; to prevent free air collected in boiler from rising into system.

C. In-line Air Separators:
   1. Cast iron for sizes 1-1/2 inch (40 mm) and smaller, or steel for sizes 2 inch (50 mm) and larger; tested and stamped in accordance with ASME SEC 8-D; for 125 psig (860 kPa) operating pressure.

D. Combination Air Separators/Strainers:
   1. Steel, tested and stamped in accordance with ASME SEC 8-D; for 125 psig (860 kPa) operating pressure, with integral galvanized steel strainer, tangential inlet and outlet connections, and internal stainless steel air collector tube.

2.8 STRAINERS

A. Manufacturers: Armstrong, Itt, Keckley, Mueller, Metraflex, Victaulic, Gustin, and Bacon.

B. Size 2 inch (50 mm) and Under:
   1. Screwed brass or iron body for 175 psig (1200 kPa) working pressure, Y pattern with 1/32-inch (0.8 mm) stainless steel perforated screen.

C. Size 2-1/2 inch (65 mm) to 4 inch (100 mm):
   1. Flanged iron body for 175 psig (1200 kPa) working pressure, Y pattern with 3/64-inch (1.2 mm) stainless steel perforated screen.

D. Size 5 inch (125 mm) and Larger:
   1. Flanged iron body for 175 psig (1200 kPa) working pressure, basket pattern with 1/8-inch (3.2 mm) stainless steel perforated screen.

2.9 FLOW METERS

A. Manufacturers: Bell and Crossett, Lierand, Armstrong, Taco, Amtrol.

B. Orifice type by-pass circuit with direct reading gage, soldered or flanged piping connections for 125 psig (860 kPa) working pressure, with shut off valves, and drains and vent connections.

C. Direct reading with insert pitot tube, threaded coupling, for 150 psig (1034 kPa) working pressure, maximum 240 degrees F (115 degrees C), 5 percent accuracy.

D. Cast iron, wafer type, orifice insert flow meter for 250 psig (1720 kPa) working pressure, with read-out valves equipped with integral check-valves and caps with gaskets.

E. Calibrated, plug type-balancing valve with precision-machined orifice, readout valves equipped with integral check valves and caps with gaskets, calibrated nameplate and indicating pointer.

F. Cast iron or bronze, globe style, balancing valve with hand wheel with vernier type ring setting and memory stop, drain connection, readout valves equipped with integral check valves and caps with gaskets.

2.10 RELIEF VALVES

A. Manufacturers: Kunkle, Watts, McDonnell & Miller.

B. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

PART 3 EXECUTIONS

2.11 INSTALLATION

A. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gage.

B. Install gage taps in piping

C. Install pressure gages with pulsation dampers.

D. Provide needle valve or ball valve to isolate each gage. Extend nipples and siphons to allow clearance from insulation.

E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches (64 mm) for installation of thermometer sockets. Allow clearance from insulation.

F. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets.

G. Install static pressure gages to measure across filters and filter banks, (inlet to outlet). On multiple banks, provide manifold and single gage.

H. Provide instruments with scale ranges selected according to service with largest appropriate scale.

I. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

J. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

K. Locate test plugs.

L. Install manual air vents at system high points.

M. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

N. Provide air separator on suction side of system circulation pump and connect to expansion tank.

O. Provide drain and hose connection with valve on strainer blow down connection.

P. Provide relief valves on pressure tanks, low-pressure side of reducing valves, heat exchangers, and expansion tanks.

Q. Select system relief valve capacity greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

R. Pipe relief valve outlet to nearest floor drain.

S. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

2.12 FIELD QUALITY CONTROL

A. Test for strength of glycol and water solution and submit written test results.

2.13 CLEANING

A. Clean and flush systems before adding final solution.

2.14 PROTECTION OF INSTALLED CONSTRUCTION

A. Do not install steam pressure gauges until after systems are pressure treated. Capacity

END OF SECTION

SECTION 15130

PUMPS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes in-line circulators, vertical in-line pumps, close-coupled pumps, and base mounted pumps.

1.2 REFERENCES

A. ASME (American Society of Mechanical Engineers) - Boiler and Pressure Vessel Codes, SEC VIII-D - Rules for Construction of Pressure Vessels.

B. UL 778 (Underwriters Laboratories, Inc.) - Motor Operated Water Pumps.

1.3 PERFORMANCE REQUIREMENTS

A. Provide pumps to operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.4 SUBMITTALS

A. Submit product data in accordance with the General Conditions of the Contract.

B. Product Data: Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements. Submit also, manufacturer model number, dimensions, service sizes, and finishes.

C. Manufacturer's Installation Instructions: Submit application, selection, and hookup configuration with pipe and accessory elevations. Submit hanging and support requirements and recommendations.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit installation instructions, servicing requirements, assembly views, lubrication instructions, and replacement parts list as per the General Conditions of the Contract.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 SYSTEM CIRCULATORS

A. Manufacturers: Bell and Crossett, Armstrong, Taco and Paco.

B. Type: Horizontal shaft, single stage, direct connected with multiple speed wet rotor motor for in-line mounting, for 140 psig (965 kPa) maximum working pressure, 230 degrees F (110 degrees C) maximum water temperature.

C. Casing: Bronze with flanged pump connections.

D. Impeller, Shaft, Rotor: Stainless Steel.

E. Bearings: Metal Impregnated carbon (graphite) and ceramic.

F. Performance: As scheduled on the Drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install long radius reducing elbows or reducers between pump and piping. Support piping adjacent to pump so no weight is carried on pump casings. For close coupled or base mounted pumps, install supports under elbows on pump suction and discharge line sizes 4 inches (102 mm) and over. Refer to Section 15070.

B. Provide line sized shut-off valve and strainer on pump suction, and line sized soft seat check valve and balancing valve on pump discharge.

C. Provide air cock and drain connection on horizontal pump casings.

D. Provide drains for bases and seals.

E. Check, align, and certify alignment of base mounted pumps prior to start-up.

F. Lubricate pumps before start-up.

3.2 FIELD QUALITY CONTROL

A. Inspect for alignment of base mounted pumps.

END OF SECTION

SECTION 15140

DOMESTIC WATER PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes domestic water piping, valves, fittings, hangers, pumps, water softeners, controls and accessories.

B. Related Sections:
1. Section 15060: Hangers and Supports.
2. Section 15070 – Mechanical Sound, Vibration, and Seismic Control: Product requirements for vibration isolators for placement by this section.
3. Section 15080 – Mechanical Identification: Product requirements for pipe identification and valve tags for placement by this section.

1.2 REFERENCES

A. ASME B16.1 (American Society of Mechanical Engineers) - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.

B. ASME B16.18 (American Society of Mechanical Engineers) - Cast Copper Alloy Solder Joint Pressure Fittings.

C. ASME B16.22 (American Society of Mechanical Engineers) - Wrought Copper and Bronze Solder Joint Pressure Fittings.

D. ASME B16.26 (American Society of Mechanical Engineers) - Cast Bronze Fittings for Flared Copper Tubes.

E. ASME B31.9 (American Society of Mechanical Engineers) - Building Service Piping.

F. ASTM B32 - Solder Metal.

G. ASTM B42 - Seamless Copper Pipe.

H. ASTM B88 - Seamless Copper Water Tube (ASTM B88M - Seamless Copper Water Tube [Metric]).

I. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

J. AWS A5.8 (American Welding Society) - Brazing Filler Metal.

K. AWWA C651 (American Water Works Association) - Disinfecting Water Mains.

L. MSS SP58 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Materials, Design and Manufacturer.

M. MSS SP-67 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Butterfly Valves.

N. MSS SP69 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Selection and Application.

O. MSS SP-70 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Gate Valves, Flanged and Threaded Ends.

P. MSS SP-71 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Swing Check Valves, Flanged and Threaded Ends.

Q. MSS SP-78 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Plug Valves, Flanged and Threaded Ends.

R. MSS SP-80 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Bronze Gate, Globe, Angle and Check Valves.

S. MSS SP-85 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends.

T. MSS SP89 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Fabrication and Installation Practices.

U. MSS SP-110 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

V. UL 1479 (National Fire Protection Association) - Fire Tests of Through-Penetration Firestops.

W. ASME A1126.1 (American Society of Mechanical Engineers) - Water Hammer Arrestors.

X. ASSE 1011 (American Society of Sanitary Engineering) - Hose Connection Vacuum Breakers.

Y. ASSE 1012 (American Society of Sanitary Engineering) - Backflow Preventers with Immediate Atmospheric Vent.

Z. ASSE 1013 (American Society of Sanitary Engineering) - Backflow Preventers, Reduced Pressure Principle.

AA. ASSE 1019 (American Society of Sanitary Engineering) - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.

BB. AWWA C506 (American Water Works Association) - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.

CC. PDI WH-201 (Plumbing and Drainage Institute) - Water Hammer Arrestors.

DD. ASHRAE 90A (American Society of Heating, Refrigerating and Air Conditioning Engineers) - Energy Conservation in New Building.

1.3 SUBMITTALS

A. Submittals: Provide as per the General Conditions of the Contract.

B. Product Data:
   1. Submit data on pipe materials; pipe fittings, valves, and accessories. Submit manufacturers catalog information. Indicate valve data and ratings.

C. Manufacturer's Installation Instructions: Submit installation instructions for valves and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of valves and equipment.

B. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.7 WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

A. Copper Tubing: ASTM B42, hard drawn.
1. Fittings: ASME B16.18 cast copper alloy or ASME B16.22 wrought copper and bronze.
2. Joints: AWS A5.8, BCuP silver braze.

B. Copper Tubing: ASTM B42, annealed
1. Fittings: ASME B16.26 cast bronze.
2. Joints: Flare

1.8 WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88 (ASTM B88M), Type L, hard drawn.
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, solder, Grade 95TA.

B. Copper Tubing: ASTM B88 (ASTM B88M), Type L, hard drawn.
1. Fittings: Cast iron, coated
2. Joints: Grooved mechanical couplings.

1.9 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 3 inches (80 mm) and Under:
1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Pipe Size Over 1 inch (25 mm):
1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Grooved and Shouldered Pipe End Couplings:
1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
2. Sealing gasket: "C" shape composition sealing- gasket.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.

1.10 PIPE HANGERS AND SUPPORTS

A. Provide as per Section 15060.

1.11 WATER PRESSURE REDUCING VALVES

A. Up to 2 inches (50 mm):
1. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, and double union ends.

B. Over 2 inches 50 mm):
1. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flange

1.12 RELIEF VALVES

A. Pressure Relief:
1. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuate.

B. Temperature and Pressure Relief:
1. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated temperature relief maximum 210 degrees F (98.9 degrees C), capacity ASME SEC IV certified and labeled.

1.13 STRAINERS

A. Size 2 inch (50 mm) and Under:
1. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32-inch (0.8 mm) stainless steel perforated screen.

B. Size 1-1/2 inch (40 mm) to 4 inch (100 mm):
1. 1Class 125, flanged iron body, Y pattern with 1/16-inch (1.6 mm) stainless steel perforated screen.

C. Size 5 inch (125 mm) and Larger:
1. Class 125, flanged iron body, basket pattern with 1/8-inch (2 mm) stainless steel perforated screen.

1.14 FIRE STOP SYSTEMS

A. General Purpose Fire Stopping Sealant: Water based non-slumping, premixed sealant with intumescent properties, rated for 3 hours in accordance with ASTM E814 and UL 1479.

B. General Purpose Vibration Resistant Fire Stopping Sealant: Silicone based, non-slumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours in accordance with ASTM E814 and UL 1479.

1.15 HOSE BIBS

A. Interior: Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with lock shield and removable key, integral vacuum breaker in conformance with ANSI/ASSE 1011.

B. Interior Mixing: Bronze or brass, wall mounted, double service faucet with hose thread spout, integral stops, chrome plated where exposed with hand wheels, and vacuum breaker in conformance with ANSI/ASSE 1011.

1.16 HYDRANTS

A. Wall Hydrant: ANSI/ASSE 1019; non-freeze, self-draining type with polished bronze, wall plate, lockable recessed box, hose thread spout, hand wheel, locks shield and removable key, and integral vacuum breaker.

1.17 BACKFLOW PREVENTERS

A. Manufacturers: Conbraco, Watts, Febco, Hersey.

B. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013, AWWA C506
1. Bronze body, with bronze internal parts and stainless steel springs.
2. Two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve opening under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

1.18 WATER HAMMER ARRESTORS

A. Manufacturers: Precision Plumbing Products Company (Wade Shokstop, JR Smith, Josam, Zurn)

B. ANSI A1126.1; copper, construction, bellows, type sized in accordance with PDI WH-201.

C. Pre-charged suitable for operation in temperature range 34 to 250 degrees F and maximum 150 psi (1000 kPa) working pressure.

PART 2 EXECUTION

2.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavate

2.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

2.3 INSTALLATION

A. Install Work in accordance with International Plumbing Code and Salt Lake City standards.

B. Install non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

E. Group piping whenever practical at common elevations.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15060.

G. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with General Contractor.

H. Establish elevations of buried piping outside the building to obtain not less than 3-1/2 ft of cover.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

J. Install valves with stems upright or horizontal, not inverted.

K. Install water piping in accordance with ASME B31.9.

L. Sleeve pipes passing through partitions, walls and floors.

M. Inserts:
1. Provide inserts for placement in concrete forms.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

N. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9, ASTM F708 and MSS SP89.
2. Support horizontal piping as schedule
3. Install hangers to provide minimum 1/2-inch (15 mm) space between finished covering and adjacent work.
4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every [other] floor. Support riser piping independently of connected horizontal piping.
7. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.

O. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler

systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.

P. Pipe relief from valves, back-flow preventers and drains to nearest floor drain.

Q. Install water hammer arrestors in accordance to plumbing drainage institute standard WH-201. Provide 8” x 8” access panel to provide access to arrestor.

2.4 SERVICE CONNECTIONS

A. Provide new water service complete with approved reduced pressure back-flow preventer and pressure reducing valve and sand strainer.

B. Provide sleeve in wall for service main and support at wall with reinforced-concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

END OF SECTION

SECTION 15150

SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes pipe, pipe fittings, connections and equipment for sanitary sewer piping systems. This section also includes floor drains, cleanouts.

B. Related Sections: Section 15060: Hangers and Supports.
1. Section 15075 - Mechanical Identification: Product requirements for pipe identification for placement by this section.

1.2 REFERENCES

A. ASME B13 (American Society of Mechanical Engineers) - Malleable Iron Threaded Fittings.

B. ASME B123 (American Society of Mechanical Engineers) - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.

C. ASME B31.9 (American Society of Mechanical Engineers) - Building Services Piping.

D. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

E. ASTM A74 - Cast Iron Soil Pipe and Fittings.

F. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

G. ASTM E814 - Fire Tests of Through-Penetration Fire Stops.

H. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

I. ASME A1121.1 (American Society of Mechanical Engineers) - Floor Drains.

J. CISPI 301 (Cast Iron Soil Pipe Institute) - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

K. CISPI 310 (Cast Iron Soil Pipe Institute) - Joints for Hubless Cast Iron Sanitary Systems.

L. MSS SP58 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Materials, Design and Manufacturer.

M. SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

N. UL 1479 (Underwriters Laboratories, Inc.) - Fire Tests of Through-Penetration Firestops.

1.3 SUBMITTALS

A. Provide in accordance with the General Conditions of the Contract.

B. Product Data: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information. Indicate component sizes, rough-in requirements, service sizes, and finishes.

C. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
1. Fittings: Cast iron.
2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hub-less, service weight.
1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.3 PIPE HANGERS AND SUPPORTS

A. Drain, Waste, and Vent: Conform to ASME B31.9, ASTM F708.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Carbon steel, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

E. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hooks.

F. Wall Support for Pipe Sizes Over 3 inches (100 mm): Welded steel bracket and wrought steel clamp.

G. Vertical Support: Steel riser clamp.

H. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

I. Copper Pipe Support: Carbon-steel, copper-plated adjustable ring.

2.4 FIRE STOP SYSTEMS

A. General Purpose Fire Stopping Sealant: Water based non-slumping, premixed sealant with intumescent properties, rated for 3 hours in accordance with ASTM E814 and UL 1479.

B. General Purpose Vibration Resistant Fire Stopping Sealant: Silicone based, non-slumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours in accordance with ASTM E814 and UL 1479.

2.5 FLOOR DRAINS

A. Manufacturers: Wade, JR Smith, Josam, and Zurn.

B. Provide as scheduled on the Drawings.

2.6 FLOOR SINKS

A. Manufacturers: Wade, J.R. Smith, Josam, and Aurn.

B. Provide as scheduled on the Drawings.

2.7 CLEANOUTS

A. Manufacturers: Wade, J.R. Smith, Josam, and Zurn.

B. Exterior Surfaced Areas: Round cast nickel bronze access frame and non-skid cover.

C. Exterior Unsurfaced Areas: Line type with lacquered cast iron body and round epoxy coated cover wit gasket.

D. Interior Finished Floor Areas: Galvanized cast iron body with anchor flange, threaded top assembly, and round scored cover with gasket in service areas and round depressed cover with gasket to accept floor finish in finished floor areas.

E. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated cover with gasket, and round stainless steel access cover secured with machine screw.

F. Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install Work in accordance with International Plumbing Code and Salt Lake County standards.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearances at cleanout for snaking drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

F. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

G. Install piping to maintain headroom. Do not spread piping, conserving space.

H. Group piping whenever practical at common elevations.

I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15080.

J. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with General Contractor.

K. Install piping penetrating roofed areas to maintain integrity of roof assembly.

L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

N. Install bell and spigot pipe with bell end upstream.

O. Sleeve pipes passing through partitions, walls and floors.

P. Inserts:
1. Provide inserts for placement in concrete forms.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

Q. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9, ASTM F708.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2-inch (15 mm) space between finished covering and adjacent work.
4. Place hangers within 12 inches (300 mm) of each horizontal elbow.

5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every [other] floor. Support riser piping independently of connected horizontal piping.
7. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping, sheet lead packing between hanger and support and piping.

END OF SECTION

SECTION 15160

STORM DRAINAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes pipe, pipefittings, connections and equipment for storm water piping systems. This Section also includes roof and floor-drains, cleanouts, interceptors, catch basins and sump pumps.

B. Related Sections:
1. Section 15060: Hangers and Supports.

1.2 REFERENCES

A. ASTM A74 - Cast Iron Soil Pipe and Fittings.

B. ASME B31.9 (American Society of Mechanical Engineers) - Building Services Piping.

C. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

D. CISPI 301 - (Cast Iron Soil Pipe Institute) Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

E. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

F. ASME A112.21.2 (American Society of Mechanical Engineers) - Roof Drains.

G. AWWA C110 (American Water Works Association) - Ductile - Iron and Gray - Iron Fittings 3 in. Through 48 in., for Water and Other Liquids.

H. AWWA C151 (American Water Works Association) - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

I. MSS SP58 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Materials, Design and Manufacturer

J. MSS SP89 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.3 SUBMITTALS

A. Provide in accordance with the General Contract.

B. Product Data: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information. Submit component sizes, rough-in requirements, service sizes, and finishes.

C. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 STORM WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
1. Fittings: Cast iron.
2. Joints: ASTM C564, neoprene gasket system.

2.2 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
1. Fittings: Cast iron.
2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.3 PIPE HANGERS AND SUPPORTS

A. Drain, Waste, and Vent: Conform to ASME B31.9, ASTM F708.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Carbon steel, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

E. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hook.

F. Wall Support for Pipe Sizes Over 3 inches (100 mm): Welded steel bracket and wrought steel clamp.

G. Vertical Support: Steel riser clamp.

H. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

I. Copper Pipe Support: Carbon-steel, copper-plated adjustable ring.

2.4 FIRE STOP SYSTEMS

A. General Purpose Fire Stopping Sealant: Water based non-slumping, premixed sealant with intumescent properties, rated for 3 hours in accordance with ASTM E814 and UL 1479.

B. General Purpose Vibration Resistant Fire Stopping Sealant: Silicone based, non-slumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours in accordance with ASTM E814 and UL 1479.

2.5 ROOF DRAINS

A. Manufacturers: Wade, J.R. Smith, Josam, and Zurn.

B. Roof Drain: Cast Iron Body: 15” nominal size with poly dome, flashing clamp, deck clamp, bearing pan/receiver and vandal proof screws. See Drawings for pipe size.

C. Overflow Roof Drain: Cast Iron Body, 15” nominal size with poly dome, flashing clamp, deck clamp, bearing pan/receiver, vandal proof screws and 2” standpipe or dam as required for drain style.

2.6 DOWNSPOUT NOZZLES

A. Manufacturers: Wade, J.R. Smith, Josam, and Zurn.

B. Downspout Nozzle: Nickel bronze with wall flange.

2.7 CLEANOUTS

A. Exterior Surfaced Areas: Round cast nickel bronze access frame and non-skid cover.

B. Exterior Unsurfaced Areas: Line type with lacquered cast iron body and round epoxy coated cover with gasket.

C. Interior Finished Floor Areas: Lacquered galvanized cast iron body with anchor flange, threaded top assembly, and round scored cover with gasket in service areas and round depressed cover with gasket to accept floor finish in finished floor areas.

D. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated cover with gasket, and round stainless steel access cover secured with machine screw.

E. Interior Unfinished Accessible Areas: Caulked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install Work in accordance with International Plumbing Code and Salt Lake County standards.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearance at cleanout for snaking drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install non-conducting dielectric connections wherever jointing dissimilar metals.

F. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

G. Install piping to maintain headroom. Group piping to conserve space.

H. Group piping whenever practical at common elevations.

I. Flash all drains on roof with 24” x 24” minimum flashing pan.

J. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with General Contractor.

K. Terminate storm and overflow drains into full size nickel bronze downspout nozzle as indicated on the Drawings. Seal space between wall opening and pipe with silicone seal. Anchor nozzle wall flange with ¼” flat head machine bolts and lead expanders.

L. Install piping penetrating roofed areas to maintain integrity of roof assembly.

M. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

N. Install bell and spigot pipe with bell end upstream.

O. Sleeve pipes passing through partitions, walls and floors.

P. Inserts:
1. Provide inserts for placement in concrete forms.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

Q. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9, ASTM F708.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2-inch (15 mm) space between finished covering and adjacent work.
4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
7. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Support cast iron drainage piping at every joint.

3.4 ERECTION TOLERANCES

A. Establish invert elevations, slopes for drainage as indicated on Drawings.

END OF SECTION

SECTION 15190

FUEL PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes piping, fittings, and valves, for fuel piping systems.

B. Related Sections:
1. Section 15060: Hangers and Supports.
2. Section 15110: Valves.
3. Section 15075 – Mechanical Identification: Product requirements for valve and pipe identification for placement by this section.

1.2 REFERENCES

A. ASME Section IX (American Society of Mechanical Engineers) - Welding and Brazing Qualifications.

B. ASME B16.3 (American Society of Mechanical Engineers) - Malleable Iron Threaded Fittings.

C. ASME B31.2 (American Society of Mechanical Engineers) - Fuel Gas Piping.

D. ASME B31.9 (American Society of Mechanical Engineers) - Building Service Piping.

E. ASME B36.10 (American Society of Mechanical Engineers) - Welded and Seamless Wrought Steel Pipe.

F. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

G. ASTM A234/A234M - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

H. AWS D1.1 (American Welding Society)-Structural Welding Code.

I. NFPA 54 (National Fire Protection Association) – National Fuel Gas Code.

J. UL 1479 (Underwriters Laboratories, Inc.) - Fire Tests of Through-Penetration Firestops.

1.3 SUBMITTALS

A. Submittals: Provide in accordance with the General Conditions of the Contract.

B. Product Data: Submit data on pipe materials, pipefittings, valves and accessories. Submit manufacturers catalog information. Indicate valve data and ratings.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of valves, piping system, and system components.

B. Operation and Maintenance Data: Submit installation instructions, spare parts lists.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 54 and Questar Gas standards.

B. Perform Work in accordance with ASME B31.2, ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.

C. Perform Work in accordance with applicable authority for welding hanger and support attachments to building structure.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53 Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M forged steel welding type.
   2. Joints: NFPA 54 threaded or welded to ASME B31.2, ASME B31.9.

2.2 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 inches (50 mm) and Under:
   3. Ferrous pipe: 150-psi (1034 kPa) malleable iron threaded unions.
   4. Copper tube: 150 psi (1034 kPa) bronze unions with brazed joints.

B. Pipe Size Over 2 inches (50 mm):
   1. Ferrous pipe: 150 psi (1034 kPa) forged steel slip-on flanges; 1/16-inch (1.6 mm) thick preformed neoprene gaskets.
   2. Copper tube: 150-psi (1034 kPa) slip-on bronze flanges; 1/16-inch (1.6 mm) thick preformed neoprene gaskets.

2.3 PIPE HANGERS AND SUPPORTS

A. Conform ASME B31.2, ASME 31.9.
B. Hangers for Pipe Sizes ½ to 1-1/2 inch (15 to 40 mm): Carbon steel, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

E. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hook.

F. Vertical Support: Steel riser clamp.

G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.4 FIRE STOP SYSTEMS

A. General Purpose Fire Stopping Sealant: Water based non-slumping, premixed sealant with in tumescent properties, rated for 3 hours in accordance with ASTM E814 and UL 1479.

B. General Purpose Vibration Resistant Fire Stopping Sealant: Silicone based, non-slumping, premixed sealant with in tumescent properties, vibration and moisture resistant, rated for 3 hours in accordance with ASTM E814 and UL 1479.

PART 3 EXECUTIONS

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions

3.3 INSTALLATION

A. Install natural gas piping in accordance with ASME B31.2.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals. Install in accordance with NACE RP-01-69.

C. Route piping in orderly manner and maintain gradient.

D. Install piping to conserve building space and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with General Contractor.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, weld, and apply one coat of zinc rich primer.

J. Provide support for utility meters in accordance with requirements of utility company.

K. Pipe vents from gas pressure reducing valves to outdoors and terminate in weatherproof hood.

L. Install identification on piping systems including underground piping. Refer to Section 15075.

M. Install valves with stems upright or horizontal, not inverted.

N. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

O. Provide new gas service. Gas service distribution piping to have initial minimum pressure of 2 lb.

END OF SECTION

SECTION 15300

FIRE SPRINKLERS & PIPING

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 piping and equipment for the following building systems:
1. Automatic wet-type, Class II for sprinklers.
2. Wet-pipe sprinklers, including piping, valves, specialties.
3. Manual –Dry type-Class I, fire-suppression standpipes.

B. Related Sections include the following:
1. Division 15070 Hangered Supports.
2. Division 15120 Piping Specialties

1.3 DEFINITIONS

A. Working Plans: Documents, including drawings, calculations, and material specifications prepared according to NFPA 13 and NFPA 14 for obtaining approval from authorities having jurisdiction.

B. Authority having Jurisdiction: The building official, and Engineer.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. Design standpipes and sprinklers and obtain approval from authorities having jurisdiction.

B. Design standpipes and obtain approval from authorities having jurisdiction. Include minimum residual pressures at hydraulically remote outlets according to the following.
1. NPS 1-1/2” Hose Connections: 65 psig.

C. Design sprinkler piping according to the following and obtain approval from authorities having jurisdiction.
1. Office and Public Areas: Light Hazard.
2. Restaurant Seating Areas: Light Hazard.
3. Kitchen: Ordinary Hazard, Group 1.
4. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
5. Building Service Areas: Ordinary Hazard, Group 1.
6. Electrical Equipment Rooms: Ordinary Hazard, Group 1.

1.5 SUBMITTALS

A. Product Data: For the following:
1. Pipe and fitting materials and methods of joining for sprinkler and standpipe piping.
2. Valves, including specialty valves, accessories, and devices.
3. Alarm devices. Include electrical data.
4. Hose connections. Include size, type and finish.

5. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish and other pertinent data.

B. Fire-Hydrant Flow Test Report:

C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction. Include hydraulic calculations, unless noted otherwise.

D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13 and NFPA 14. Include "Contractor's Materials and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

E. Maintenance Data: For each type of standpipe and sprinkler specialty to include in maintenance manuals specified in Division 1.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has designed and installed sprinkler piping similar to that indicated for this Project and obtained design approval and inspection approval from authorities having jurisdiction. Fire protection contractors pre-approved to submit bids for this project are Firetrol, Fire Engineering, and Western Automatic Sprinkler. Other contractors shall submit documentation to the engineer prior to bidding. Allowance of additional contractors shall be by addendum.

B. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer or Engineering Technician NICET Level III. Base calculations on results of fire hydrant flow test or the Engineer's water analysis.

C. Manufacturer Qualifications: Firms whose equipment, product name and manufacturer in UL's "Fire Protection Equipment Directory" list specialties, and accessories and FM's "Figure Protection Approval Guide" and that comply with other requirements indicated.

D. Standpipe and Sprinkler Components: Listing/approval stamp, label or other marking by a testing agency acceptable to authorities having jurisdiction.

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

F. NFPA Standards: Equipment, specialties, accessories, installation and testing complying with the following:
1. NFPA 13 (Latest Edition), "Installation of Sprinkler Systems."
2. NFPA 14 (Latest Edition), "Standpipe and Hose Systems."
3. NFPA 70 (Latest Edition), "National Electric Code."
4. NFPA 72 (Latest Edition), "National Fire Alarm Code."

G. International Conference of Building Code Officials codes and standards complying with the following:
1. IBC-2000, "International Building Code."
2. IFC-2000, "International Fire Code."

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. Sprinkler Cabinets: A supply of spare sprinklers (never less than 6) shall be supplied and located in a cabinet where the temperature does not exceed 100 F. These sprinklers shall correspond to the types and temperature rating of the sprinklers installed on the project. Special sprinkler head wrenches shall be included to correspond to the types of heads provided.

   The stock of spare sprinklers shall include all types and ratings installed and shall be as follows:

   a. For systems with not over 300 sprinklers, not less than 6 sprinklers.
   b. For systems with 300 to 1000 sprinklers, not less than 12 sprinklers.
   c. For systems with over 1000 sprinklers, not less than 24 sprinklers.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Specialty Valves and Devices:
   a. Central Sprinkler Corp.
   b. Firematic Sprinkler Devices, Inc.
   c. Globe Fire Sprinkler Corp.
   d. Grinnell Corp.
   e. Reliable Automatic Sprinkler Co., Inc.
   f. Viking Corp.

2. Water-Flow Indicators and Supervisory Switches:
   a. Grinnell Corp.
   b. Potter Electric Signal Co.
   c. Reliable Automatic Sprinkler Co., Inc.
   d. Viking Corp.
   e. Watts Industries, Inc.; Water Products Div.

3. Sprinkler, Drain and Alarm Test Fittings:
   a. Central Sprinkler Corp.
   b. Grinnell Corp.
   c. Victaulic Co. of America

4. Sprinkler, Branch-Line Test Fittings:
   a. Smith Industries, Inc.; Potter-Roemer Div.

5. Sprinkler, Inspector's Test Fittings:
   a. Grinnell Corp.
   b. Central Sprinkler.

6. Sprinklers:
   a. Central Sprinkler Corp., (except "Omega" type sprinklers).
   b. Firematic Sprinkler Devices, Inc.
   c. Globe Fire Sprinkler Corp.
   d. Grinnell Corp.
   e. Reliable Automatic Sprinkler Co., Inc.

7. Gate Valves:
   a. American Cast Iron Pipe Co.; Waterous Co.
   b. Grinnell Corp.

c. Nibco, Inc.
d. Stockham Valves & Fittings, Inc.

8. Indicator Valves:
   a. Central Sprinkler, Inc.
   b. Grinnell Corp.
   c. Nibco, Inc.
   d. Victaulic Co. of America.

9. Fire-Protection-Service Valves:
   a. Central Sprinkler Corp.
   b. Grinnell Corp.
   c. Nibco, Inc.
   d. Victaulic Co. of America

10. Keyed Couplings:
    a. Grinnell Corp.
    b. Victaulic Co. of America.
    c. Central Sprinkler Corp.

2.2 PIPE AND TUBES

A. Standard-Weight Steel Pipe: ASTM A 53, ASTM A 135, or ASTM A 795; Schedule 40 in NPS 6 and smaller, and Schedule 30 in NPS 8 and larger. Schedule 10 pipes for mains.

2.3 PIPE AND TUBE FITTINGS

A. Cast-Iron Threaded Flanges: ASME B16.1.

B. Cast-Iron Threaded Fittings: ASME B16.4.

C. Steel, Threaded Couplings: ASTM A 865.

D. Steel Welding Fittings: ASTM A 234/A 234M, ASME B16.9, or ASME B16.11.

E. Steel Flanges and Flanged Fittings: ASME B16.5.

F. Steel, Grooved-End Fittings: UL-listed and FM-approved, ASTM A 47, malleable iron or ASTM A 536, ductile iron; with dimensions matching steel pipe and ends factory grooved according to AWWA C606.

2.4 JOINING MATERIALS

A. Refer to Division 15 Section “Basic Mechanical Materials and Methods” for pipe-flange gasket materials and welding filler metals.

B. Steel, Keyed Couplings: UL 213 and AWWA C606, for steel-pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gaskets, and steel bolts and nuts. Include listing for dry-pipe service for coupling for dry piping.

2.5 GENERAL-DUTY VALVES

A. Refer to Division 15 Section “Valves” for gate, ball, butterfly, globe, and check valves not required to be UL listed and FM approved.

2.6 FIRE-PROTECTION-SERVICE VALVES

A. General: UL listed and FM approved, with minimum 175-psig no shock working-pressure rating. Valves for grooved-end piping may be furnished with grooved ends instead of type of ends specified.

B. Gate Valves, NPS 2 and Smaller: UL 262; cast-bronze, threaded ends, solid wedge; OS&Y; and rising stem.

C. Indicating Valves, NPS 2-1/2 and Smaller: UL 1091; butterfly or ball-type bronze body with threaded ends; and integral indicating device.
   1. Indicator: Electrical prewired, supervisory switch. Coordinate voltage and number of circuits with Fire Alarm requirements.

D. Gate Valves, NPS 2-1/2 and Larger: UL 262, iron body, bronze mounted, taper wedge, OS&Y, and rising stem. Include replaceable, bronze, wedge facing ranges and flanged ends.

E. Swing Check Valves, NPS 2 and Smaller: UL 312 or MSS SP-80, Class 150; bronze body with bronze disc and threaded ends.

F. Swing Check Valves, NPS 2-1/2 and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze-disc ring and flanged ends.

2.7 SPECIALTY VALVES

A. Alarm Check Valves: UL 193, 175-psig working pressure; designed for horizontal or vertical installation, with cast-iron flanged inlet and outlet, bronze grooved seat with O-ring seals, and single-hinge pin and latch design. Include trim sets for bypass, drain, electric sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
   1. Option: Grooved-end connections for use with keyed couplings.
   2. Drip Cup Assembly: Pipe drain without valves, and separate from main drain piping.

2.8 SPRINKLERS

A. Automatic Sprinkler: With heat-responsive element complying with the following:
   1. NFPA 13, Latest Edition

B. Sprinkler Type and Categories: “Ordinary” temperature classification rating, unless otherwise indicated or required by application. Areas of light hazard occupancy shall be of the quick response type.
   1. Orifice: ½ inch with discharge coefficient K between 5.3 and 5.8.
   2. Orifice: 17/32 inch with discharge coefficient K between 7.4 and 8.2.
   3. Orifice: Extra large orifice allowed in Exhibition Hall.

C. Sprinkler types, features, and options include the following:
   1. Concealed ceiling sprinklers, including cover plate painted to match existing sprinklers and ceiling.
   2. Extended-coverage sprinklers – allowed in Exhibition Hall.
   3. Pendent sprinklers.
   4. Pendent, dry-type sprinklers.
   5. Quick-response sprinklers.
   6. Recessed sprinklers, including escutcheon to match existing sprinklers.

7. Sidewall sprinklers.
8. Sidewall, dry-type sprinklers.
9. Upright sprinklers.
10. Sprinklers above ballroom ceiling to have black finish/others to match existing sprinklers.

D. Sprinkler Finishes: Chrome-plated black anodized, bronze, and painted.

E. Special Coatings: Wax, lead, and corrosion-resistant paint.

F. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

2.9 ALARM DEVICES

A. General: Types matching piping and equipment connections.

B. Water-Motor-Operated Alarms: UL 753, mechanical-operation type with pelt on-wheel operator with shaft length, bearings and sleeve to suit wall construction and 10-inch-diameter, cast-aluminum alarm gong with red-enamel factory finish. Include NPS ¾ inlet and NPS 1 drain connections.

C. Water-Flow Indicators: UL 346; electrical-supervision, vane-type water-flow detector, with 250-psig pressures rating; and designed for horizontal or vertical installation. Include two single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed. For wet system only.

D. Pressure Switches: UL 753; electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operate on rising pressure and signals water flow. For dry system only.

E. Valve Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

F. Indicator-Post Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled indicator-post valve is in other than fully open position.

2.10 PRESSURE GAGES

A. Pressure Gages: UL 393, 3-1/2- to 4-1/2-inch- diameter dials with dial range of 0 to 250 psig.

2.11 COORDINATION

A. All work of this contractor will be coordinated with other trades to insure minimal changes to the sprinkler system from the designs. Careful coordination of mechanical and electrical ducts, pipe and conduit shall be required.

B. The ceiling plenum must be carefully reviewed and coordinated with all trades. In the event of conflict, the installation of the mechanical equipment and piping shall be in the following order: plumbing waste, rainwater, and soil lines; supply, return, and exhaust ductwork, water piping, fire protection piping.

C. All piping shall be run concealed where possible. All lines will be run as high as possible so as to not interfere with future changes to ceiling heights or other mechanical equipment. This contractor will be responsible for all sleeves, core drills, and sealing of penetrations in walls, floors and structural members to facilitate the installation of the system.

2.12 VALVE APPLICATIONS

A. Indicate valve types to be used. The following requirements apply:

1. Fire-Protection-Service Valves: UL listed and FM approved for applications where required by NFPA 13 and NPFA 14.
   a. Shutoff Duty: Use gate valves at building entry. Use butterfly valves at other locations.

2. General-Duty Valves: for applications where UL-listed and FM-approved NFPA 13 and NFPA 14 do not require valves.
   a. Shutoff Duty: Use gate, ball, or butterfly valves.

2.13 JOINT CONSTRUCTION

A. Refer to Division 15 Section “Basic Mechanical Materials and Methods” for basic piping joint construction.

B. Steel-Piping, Grooved Joints: Use Schedule 40 steel pipe with cut or roll-grooved ends and Schedule 30 or thinner steel pipe with roll-grooved ends; steel, grooved-end fittings; and steel, keyed couplings. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer’s written instructions. Use gaskets listed for dry-pipe service for dry piping.

C. Dissimilar-Piping-Material Joints: Construct joints using adapters or couplings compatible with both piping materials. Use dielectric fittings if both piping materials are metal. Refer to Division 15 Section “Basic Mechanical Materials and Methods” for dielectric fittings.

2.14 SERVICE-ENTRANCE PIPING

A. Connect standpipe and sprinkler piping to fire supply piping of size and in location indicated.

2.15 PIPING INSTALLATION

A. Refer to Division 15 Section for basic piping installation.

B. Locations and Arrangements: Drawing plans, schematics and diagram indicate general location and arrangement of piping.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

C. Install mechanical sleeve seal at pipe penetrations in basement and foundation walls. Refer to Division 15 Section.

D. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.

F. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections grooved couplings may be used.

G. Install “Inspector’s Test Connections” in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install drain valves on standpipes.

J. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building. Install ball drips as needed on dry standpipe for drainage.

K. Install alarm devices in piping systems.

L. Hangers and Supports: Comply with NFPA 13 for hanger materials. Install according to NFPA 13 for sprinkler piping and to NFPA 14 for standpipes.

M. Seismic Protection: Install piping according to NFPA 13 – see Section 15070.

N. Install piping with grooved joints according to manufacturer’s written instructions. Construct rigid piping joints, unless otherwise indicated, or required by NFPA 13 for flexibility in seismic zones.

O. Install pressure gages on riser. Include pressure gages with connection not less than NPS ¼ and with soft metal-seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

2.16 VALVE INSTALLATION

A. Refer to Division 15 Section “Valves” for installing general-duty valves. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13 and NFPA 14, manufacturer’s written instructions, and authorities having jurisdiction.

B. Gate Valves: Install fire-protection-service valves supervised-open, located to control sources of water supply except from fire department connections. Provide permanent identification signs indicating portion of system controlled by each valve.

C. Alarm Check Valves: Install valves in vertical or horizontal position for proper direction of flow, including bypass check valve and retard chamber drain-line connection. Install valve trim in accordance with the valve manufacturer’s appropriate trim diagrams. Install main drain to exterior.

D. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment. Test valve for proper operation. Install main drain to exterior.

1. Air-Pressure Maintenance Devices for Dry-Pipe Systems: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer, pressure ratings with 14- to 60-psig adjustable range; and 175-psig maximum inlet pressure.

2. Install compressed-air supply piping from building compressed-air piping system.

2.17 SPRINKLER APPLICATIONS

A. General: Sprinkler heads shall be of the latest design closed spray type of 165 F unless specified otherwise or required by code. Heads in light hazard of shall be quick response type. Heads shall be a minimum orifice size of ½". Temperature rating of heads in elevator shafts shall be 286 F. Extra Large Orifice (ELO) heads shall not be used unless specified. Orifices larger than ½" may be used as required by density and spacing demands when specified. Use sprinklers according to the following applications:

1. Rooms without Ceilings: Upright and/or pendent sprinklers. Provide mechanical guards on all heads at or below 7'-0" height above the floor or where damage from room occupant use may occur.
2. Rooms with Suspended Ceilings: Recessed sprinklers.
3. Rooms with Suspended Ceilings: Concealed sprinklers.
4. Wall Mounting: Sidewall sprinklers with recessed escutcheon.
5. Spaces Subject to Freezing: Upright; pendent, dry-type; and sidewall, dry-type sprinklers.
6. Provide freeze proof type automatic sprinkler heads serving loading dock, unconditioned spaces, and areas subject to freezing and in other areas requiring their use.

2.18 SPRINKLER INSTALLATION

A. Every effort shall be required to insure that the heads form a symmetrical pattern in the ceiling grid, lights, diffusers and grilles. Offsets shall be made in piping to accommodate ductwork in the ceiling. Heads should be symmetrical and all piping run parallel or perpendicular to building lines.

1. In no case shall sprinkler heads be installed closer than approved distances from ceiling obstructions.
2. Automatic sprinkler heads located in corridors shall be in centerline of corridor.

B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space.

C. Install sprinkler in top and bottom of elevator shafts as required by code.

2.19 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and NFPA 14 and in Division 15 Section "Mechanical Identification."

2.20 FIELD QUALITY CONTROL

A. Flush, test, and inspect sprinkler piping according to NFPA 13, "System Acceptance" Chapter.

B. Replace piping system components that do not pass test procedures and retest to demonstrate compliance.

C. Report test results promptly and in writing to architect and authorities having jurisdiction.

2.21 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers having paint other than factory finish.

2.22 PROTECTION

A. Protect sprinkler from damage until Substantial Completion.

2.23 COMMISSIONING

A. Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.

B. Verify that air compressors and their accessories are installed and operate correctly.

C. Verify that specified tests of piping are complete and that “Material Test Certificates” are complete.

D. Verify that damaged sprinklers and sprinklers with paint or coating not specified are replaced with new, correct type.

E. Verify that sprinklers are correct types, have correct finishes and temperature ratings, and have guards as required for each application.

F. Drain dry-pipe sprinkler piping.

G. Pressurize and check dry-pipe sprinkler piping air-pressure maintenance devices and air compressors.

H. Fill wet-pipe sprinkler piping with water.

I. Adjust operating controls and pressure settings.

J. Coordinate with fire alarm tests. Operate as required.

2.24 DEMONSTRATION & TESTS

A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.

B. All tests will be conducted as required by the local authority having jurisdiction, and in no case less than those required by NFPA standards. As a minimum, piping in the sprinkler system shall be tested at a water pressure at 200 psi for a period of not less two hours, or at 50 psi. Bracing shall be in place, and air shall be removed from the system through the hydrants and drain valves before the test pressure is applied. No apparent leaks will be permitted on interior or underground piping.

C. The local jurisdiction having authority shall be notified at least three working days in advance of all tests and flushing. This includes any flushing of undergrounds, hydrostatic testing, or flow testing that may be required.

D. This contractor shall make all the required tests to the sprinkler system as required by code. He shall be responsible to assure that the Contractor Test Certificates for the overhead and underground work are completed and delivered to the owner’s insurance underwriter to assure proper insurance credit.

E. All tests requiring the witnessing by local authorities will be the responsibility of this contractor. If tests are not run or do not have the proper witness, then they will be run

later and all damage caused by the system, or caused in uncovering the system for such test, will be borne by this contractor.

F. Trip test dry pipe sprinkler system as required by code and authority having jurisdiction.

2.25 WARRANTY

A. This contractor shall warranty the sprinkler system and all its components for one year from the date of acceptance by the owner. Any costs incurred to extend any warranties of materials to assure this time frame shall be borne by this contractor.

END OF SECTION

SECTION 15410

PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes water closets, lavatories, sinks, service sinks, electric water coolers, and drinking fountains.

B. Related Sections:
1. Section 15140 – Domestic Water Piping: Supply connections to plumbing fixtures.
2. Section 15150 – Sanitary Waste and Vent Piping: Waste connections to plumbing fixtures.

1.2 REFERENCES

A. ARI 1010 (Air-Conditioning and Refrigeration Institute) - Drinking Fountains and self-contained Mechanically Refrigerated Drinking Water Coolers.

B. ASME A112.6.1 (American Society of Mechanical Engineers) - Supports for Off-the-Floor Plumbing Fixtures for Public Use.

C. ASME A112.18.1 (American Society of Mechanical Engineers) - Finished and Rough Brass Plumbing Fixture Fittings.

D. ASME A112.19.1 (American Society of Mechanical Engineers) - Enameled Cast Iron Plumbing Fixtures.

E. ASME A112.19.2 (American Society of Mechanical Engineers) - Vitreous China Plumbing Fixtures.

F. ASME A112.19.3 (American Society of Mechanical Engineers) - Stainless Steel Plumbing Fixtures.

G. ASME A112.19.4 (American Society of Mechanical Engineers) - Porcelain Enameled Formed Steel Plumbing Fixtures.

H. ASME A112.19.5 (American Society of Mechanical Engineers) - Trim for Water-Closet Bowls, Tanks, and Urinals.

1.3 SUBMITTALS

A. Submittal: Provide in accordance with the General Conditions of the Contract.

B. Product Data: Submit catalog illustrations of fixtures, sizes, rough in dimensions, utility sizes, trim, and finish.

C. Manufacturer's Installation Instructions: Submit installation methods and procedures.

1.4 CLOSEOUT SUBMITTALS

A. Provide in accordance with the General Conditions of the Contract.

B. Operation and Maintenance Data: Submit fixture, trim, exploded view and replacement parts lists.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 PRODUCTS

2.1 WATER CLOSETS

A. Manufacturers: Kohler, Eljer, American Standard, and Crane.

B. Provide as scheduled on the Drawings.

2.2 URINALS

A. Manufacturers: Kohler, American Standard, Eljer, and Crane.

B. Provide as scheduled on the Drawings.

2.3 LAVATORIES

A. Manufacturers: Kohler, American Standard, Eljer, and Crane.

B. Provide as scheduled on the Drawings.

2.4 ELECTRIC WATER COOLERS

A. Manufacturers: Elkay, Haws, Oasis, Sunroc.

B. Provide as scheduled on the Drawings.

2.5 SERVICE SINKS

A. Manufacturers: Kohler, Eljer, American Standard, and Crane.

B. Provide as scheduled on the Drawings.

PART 3 EXECUTIONS

3.1 EXAMINATION

A. Verify walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify electric power is available and of correct characteristics.

C. Confirm millwork is constructed with adequate provision for installation of counter top lavatories and sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install Work in accordance with International Plumbing Code and Salt Lake County standards.

B. Install each fixture with trap, easily removable for servicing and cleaning.

C. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

D. Install components level and plumb.

E. Install and secure fixtures in place with wall carriers and bolts.

F. Seal fixtures to wall and floor surfaces with sealant color to match fixture.

G. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop-drawings. Confirm location and size of fixtures and openings before rough in and installation.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

A. Clean plumbing fixtures and equipment.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Do not permit use of fixtures before final acceptance.

END OF SECTION

SECTION 15480

DOMESTIC WATER HEATERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Commercial gas-fired water heaters.
2. Commercial electric water heaters.

B. Related Sections:
1. Section: 15140 - Domestic Water Piping: Supply connections to domestic water heaters.
2. Section 15190 - Fuel Piping: Execution requirements for gas and oil piping connections specified by this section.
3. Section 15550 - Breeching, Chimneys, and Stacks: Execution requirements for breeching, chimney, and stack connections to water heaters specified in this section.

1.2 REFERENCES

A. American National Standards Institute:
1. ANSI Z21.10.1 - Gas Water Heaters Vol. I Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less.
2. ANSI Z21.10.3 - Gas Water Heaters - Vol. III Storage, with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous Water Heaters.

B. American Society of Mechanical Engineers:
1. ASME PTC 25 - Pressure Relief Devices.
2. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.

C. National Fire Protection Association:
1. NFPA 54 - National Fuel Gas Code.

1.3 SUBMITTALS

A. Product Data: Submit dimensioned drawings of water heaters indicating components and connections to other equipment and piping. Indicate pump type, capacity and power requirements. Submit certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Submit electrical characteristics and connection locations.

B. Manufacturer's Installation Instructions: Submit mounting and support requirements.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit replacement part numbers and availability.

1.5 QUALITY ASSURANCE

A. Conform to ASME for construction of water heaters. Provide boilers registered with National Board of Boiler and Pressure Vessel Inspectors.

B. Perform Work in accordance with State Municipality of Summit standard.

C. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept water heaters on site in original labeled cartons. Inspect for damage.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 WARRANTY

A. Section 01700 - Execution Requirements: Product warranties and product bonds.

B. Furnish 10-year manufacturer warranty for domestic water heaters packaged water heating systems.

PART 2 PRODUCTS

2.1 COMMERCIAL GAS FIRED WATER HEATERS

A. Manufacturers:
1. A. O. Smith
2. Lochinvar
3. Rund
4. State Industries
5. PVI Industries

B. Type: Automatic, natural gas-fired, vertical storage

C. Capacity: As scheduled on drawings.
1. Maximum working pressure: 150 psig (1000 kPa).
2. Certification: ANSI Z21.10.1, ANSI Z21.10.3.

D. Tank: Glass lined welded steel ASME labeled; multiple flue passages, 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.

E. Accessories: Brass water connections and dip tube drain valve, magnesium anode, and ASME rated temperature and pressure relief valve.

F. Approval: By AGA as automatic storage water heater and automatic circulating tank water heater for high altitude installation.

G. Controls: Automatic water thermostat with adjustable temperature range from 120 to 180 degrees F (49 to 82 degrees C). Automatic reset high temperature limiting thermostat factory set at 195 degrees F (90 degrees C), gas pressure regulator, multi-ribbon or tubular burner, 100 percent safety shut-off pilot and thermocouple, flue baffle and draft hood.

2.2 COMMERCIAL ELECTRIC WATER HEATERS

A. Manufacturers:
1. A. O. Smith
2. Lochinvar
3. Ruud
4. State Industries
5. PVI Industries

B. Furnish materials in accordance with State Municipality of Summit standards.

C. Type: Factory-assembled and wired, electric, vertical storage.

D. Capacity: As scheduled on drawings.

E. Tank: Glass lined welded steel; 4-inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.

F. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F (16 to 82 degrees C), flanged or screw-in nichrome elements, high temperature limit thermostat.

G. Accessories: Brass water connections and dip tube drain valve, magnesium anode, and ASME rated temperature and pressure relief valve.

PART 3 EXECUTION

3.1 INSTALLATION

A. Maintain manufacturer's recommended clearances around and over water heaters.

B. Install water heater on concrete housekeeping pad, minimum 3-1/2 inches (87 mm) high and 6 inches (150 mm) larger than water heater base on each side.

C. Connect natural gas piping in accordance with NFPA 54.

D. Connect natural gas piping to water heater, full size of water heater gas train inlet. Arrange piping with clearances for burner removal and service.

E. Install the following piping accessories. Refer to Section 15140.
   1. On supply:
      a. Thermometer well and thermometer.
      b. Strainer.
      c. Pressure gage.
      d. Shutoff valve.
   2. On return:
      a. Thermometer well and thermometer.
      b. Pressure gage.
      c. Shutoff valve.

F. Install discharge piping from relief valves and drain valves to nearest floor drain.

G. Install circulator and diaphragm expansion tank on water heater.

H. Install water heater trim and accessories furnished loose for field mounting.

I. Install electrical devices furnished loose for field mounting.

J. Install control wiring between water heater control panel and field mounted control devices.

K. Connect flue to water heater outlet, full size of outlet.

L. Install Work in accordance with State Municipality of Salt Lake County standards.

3.2 SCHEDULES: See drawings.

END OF SECTION

SECTION 15550

BREECHING, CHIMNEYS AND STACKS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes fabricated breeching, manufactured chimneys for gas fired equipment, vent dampers, refractory lined chimneys, manufactured double wall chimneys for fuel fired equipment, induced draft fans, single wall metal free-standing stacks.

B. Related Sections:
1. Section 15060 – Hangers and Supports: Product requirements for hangers and supports for placement by this section.
2. Section 15080 – Mechanical Insulation: Execution requirements for insulation specified by this section.

1.2 REFERENCES

A. ANSI Z21.67 - Mechanically Actuated Automatic Vent Damper Devices for Use with Gas-Fired Appliances.

B. ASTM A924 – General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

C. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM A569 - Steel, Sheet and Strip, Carbon (0.15 Maximum Percent) Hot-Rolled Commercial Quality.

E. NFPA 54 (ANSI Z223.1) (National Fire Protection Association) - The National Fuel Gas Code.

F. NFPA 211 (National Fire Protection Association) - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances.

G. SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards - Metal and Flexible.

H. UL 103 (Underwriters Laboratories, Inc.) - Standard for Factory Built Low Heat Chimneys.

I. UL 378 (Underwriters Laboratories, Inc.) - Standard for Draft Equipment.

J. UL 441 (Underwriters Laboratories, Inc.) - Standard for Gas Vents.

K. UL 641 (Underwriters Laboratories, Inc.) - Standard for Low Temperature Venting Systems.

L. UL 959 (ANSI Z181.1) (Underwriters Laboratories, Inc.) - Medium Heat Appliance Factory Built Chimneys.

M. SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) – Guide for Steel Stack Construction.

1.3 DEFINITIONS

A. Vent: Portion of a venting system designed to convey flue gases directly outdoors from a vent connector or from an appliance when a vent connector is not used.

B. Vent Connector: Part of a venting system that conducts the flue gases from the flue collar of an appliance to a chimney or vent, and may include a draft control device.

1.4 DESIGN REQUIREMENTS

A. Factory built vents and chimneys used for venting natural draft appliances complying with NFPA 211 and UL listed and labeled.

1.5 SUBMITTALS

A. Submittals: provide in accordance with the General Conditions of the Contract.

B. Product Data: Submit data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements

C. Manufacturer's Installation Instructions: Submit assembly, support details, and connection requirements.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 TYPE B DOUBLE WALL GAS VENTS

A. Manufacturers: Salkirk Metalbestos, Simpson Dura-Vent, Ameri-Vent, United McGrill, and Metal Fab.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with NFPA 54, ANSI Z223.1, and NFPA 31.

B. Install breeching with minimum of joints. Align accurately at connections, with internal surfaces smooth.

C. Support breeching from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support vertical breeching, chimneys, and stacks at 12 foot (4 m) spacing, to adjacent structural surfaces, or at floor penetrations. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for equivalent duct support configuration and size.

D. For Type B double wall gas vents, maintain UL listed minimum clearances from combustibles. Assemble pipe and accessories for complete installation.

E. Install vent dampers, locating close to draft hood collar, and secured to breeching.

END OF SECTION

SECTION 15736

PACKAGED ROOFTOP AIR CONDITIONING UNITS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Packaged rooftop air conditioning unit.
2. Roof curb.

B. Related Sections:
1. Section 15070 - Mechanical Sound, Vibration and Seismic Control: Vibration isolators.
2. Section 15190 - Fuel Piping: Gas piping connections.
3. Section 15820 - Duct Accessories: Flexible connections.
4. Section 15910 - Direct Digital Controls: Controls remote from unit.
5. Section 16xxx - Wiring Connections: Electrical connection to units.

1.2 REFERENCES

A. Air-Conditioning and Refrigeration Institute:
1. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
2. ARI 270 - Sound Rating of Outdoors Unitary Equipment.

B. American Society for Testing and Materials:
1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

C. National Fire Protection Association:
1. NFPA 54 - National Fuel Gas Code.
2. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data indicating:
1. Cooling and heating capacities.
2. Dimensions.
3. Weights.
4. Rough-in connections and connection requirements.
5. Duct connections.
6. Electrical requirements with electrical characteristics and connection requirements.
7. Controls.
8. Accessories.

C. Test Reports: Submit results of factory test at time of unit shipment.

D. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

F. Manufacturer’s Field Reports: Submit start-up report for each unit.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of controls installed remotely from units.

B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

1.5 QUALITY ASSURANCE

A. Cooling Capacity: Rate in accordance with ARI 210/240.

B. Sound Rating: Measure in accordance with ARI 270.

C. Insulation and adhesives: Meet requirements of NFPA 90A.

D. Perform Work in accordance with State Municipality of Salt Lake County standard.

E. Maintain one copy, copies of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Product storage and handling requirements.

B. Accept units on site. Inspect for damage.

C. Protect units from damage by storing off roof until roof mounting curbs are in place.

1.8 COORDINATION

A. Section 01300 - Administrative Requirements: Requirements for coordination.

B. Coordinate installation of roof curbs with roof structure, roof deck and roof membrane installation.

1.9 WARRANTY

A. Section 01700 - Execution Requirements: Product warranties and product bonds.

B. Furnish five-year manufacturers warranty for compressors.

C. Furnish five-year manufacturers warranty for heat exchangers.

1.10 MAINTENANCE SERVICE

A. Furnish service and maintenance of equipment for one year from Date of Substantial Completion. Include maintenance items as shown in manufacturer's operating and maintenance data, including filter replacements, fan belt replacement and controls checkout and adjustments.

B. Furnish 24-hour emergency service on breakdowns and malfunctions for this maintenance period.

1.11 EXTRA MATERIALS

A. Section 01700 - Execution Requirements: Spare parts and maintenance products.

B. Furnish one set of filters, fan belts for each unit.

PART 2 PRODUCTS

2.1 ROOFTOP AIR CONDITIONING UNITS

A. Manufacturers:
1. The Trane Company.
2. Carrier Corporation.
3. McQuay International.
4. Luxaire Heating & Air Conditioning.

B. Furnish materials in accordance with State Municipality of Salt Lake County standards.

C. Product Description: Self-contained packaged, factory assembled and wired with disconnect switch with factory assembled field wired convenience outlet, consisting of roof leveling curb, cabinet, supply fan, relief fan, 100% economizer, refrigerant cooling coil, compressor, refrigeration circuit, condenser, hot gas by-pass or anti coil frosting device, gas-fired heating section, air filters, mixed air casing, controls, coil guards and hinged access doors.

D. Configuration: Down flow air delivery.

E. Roof Mounting Curb: 14-inch high, leveling, galvanized steel, channel frame with gaskets, nailer strips. Full perimeter type for mounting under entire unit.

F. Cabinet:
1. Designed for outdoor installation with weatherproof construction.

2. Panels: Constructed of galvanized steel with baked enamel finish meeting salt spray test in accordance with ASTM B117. Furnish access doors.
3. Insulation: Factory applied to exposed vertical and horizontal panels. 3/4-inch thick neoprene coated glass fiber with edges protected from erosion.

G. Supply Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch motor pulley high efficiency motor. Motor permanently lubricated with built-in thermal overload protection.

H. Evaporator Coil: Constructed of copper tubes expanded onto aluminum fins. Galvanized drain pan with piping connection. Factory leak tested under water.

I. Compressor: Hermetically sealed, resiliently mounted with positive lubrication, and internal motor overload protection. Furnish internal vibration isolators, short cycle protection. Efficiencies to meet the current Energy Conservation Code.

J. Refrigeration circuit: Furnish thermal expansion valve or orifice, filter-drier, suction, discharge, and liquid line service valves with gauge ports. Dehydrate and factory charge each circuit with oil and refrigerant.

K. Condenser:
1. Coil: Copper tube aluminum fin coil assembly and coil guard. Factory leak tested under water.
2. Condenser Fan: Direct drive propeller fans statically and dynamically balanced. Wired to operate with compressor. Motor permanently lubricated with built-in thermal overload protection. Furnish high efficiency fan motors.

L. Gas-Fired Heating Section:
1. Fuel: Natural gas.
2. Heat Exchangers: Aluminized or Stainless steel, welded construction.
3. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot. Require unit fan operation before allowing gas valve to open.

M. Air Filters: 2 inches thick glass fiber disposable media in metal frames. 25 to 30 percent efficiency based on ASHRAE 52.1.

N. Mixed Air Casing:
1. Damper Leakage: Furnish dampers with maximum leakage rate of 5 percent at 1-inch water column pressure differential.
2. Economizer: Factory installed fully modulating motorized outside air and return air dampers controlled by dry bulb controller with minimum position setting. Outside air damper normally closed and return air damper normally open. Furnish barometric relief damper with powered exhaust fan. Furnish rain hood with screen.

O. Controls:
1. Furnish control to provide low ambient cooling to 0 degrees F (-29 degrees C).
2. Furnish low limit thermostat in supply air to close outside air damper and stop supply fan.
3. Wall Thermostat: temperature wired into central control system.

P. Accessories:
   1. Convenience Outlet: Factory installed 115 volt, 15 amps, and GFCI type, internally mounted field wired.

Q. Capacity: As scheduled on drawings.

2.2 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Disconnect Switch: Factory mounted and wired, non-fused type, accessible from outside unit, with power lockout capability.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify roof curbs are installed and dimensions are as shown on shop drawings.

3.2 INSTALLATION

A. Roof Curb:
   1. Assemble leveling roof curb.
   2. Install roof curb level to requirements of Seismic Engineer of record.
   3. Coordinate curb installation and flashing.
   4. Install units on roof curb providing watertight enclosure to protect ductwork and utility services. Follow manufactures installation seismic requirements.
   5. Install gasket material between unit base and roof curb.
   6. Install Rooftop on curb as required by manufacture and as required to requirements of Seismic Engineer of record.

B. Connect units to supply and return ductwork with flexible connections. Refer to Section 15820.

C. Install condensate piping with trap and route from drain pan to nearest roof drain. Refer to Section 15180.

D. Install components furnished loose for field mounting.

E. Install electrical devices furnished loose for field mounting.

F. Install control wiring between unit and field installed accessories.

3.3 INSTALLATION - NATURAL GAS HEATING SECTION

A. Connect natural gas piping in accordance with NFPA 54.

B. Connect natural gas piping to unit, full size of unit gas train inlet. Arrange piping with clearances for burner service.

C. Install the following piping accessories on natural gas piping connections. Refer to Section 15190.
   1. Strainer.

2. Pressure gage.
3. Shutoff valve.
4. Pressure reducing valve.
5. Pressure test port.
6. Min. of 18 inch of Stainless Steel flex piping as limited per code.

D. Install natural gas piping accessories below roof.

3.4 MANUFACTURER'S FIELD SERVICES

A. Furnish initial start-up and shutdown during first year of operation, including routine servicing and checkout.

3.5 CLEANING

A. Vacuum clean coils and inside of unit cabinet.

B. Install new throwaway filters in units at Substantial Completion.

3.6 SCHEDULES See drawings.

END OF SECTION

SECTION 15760

TERMINAL HEATING AND COOLING UNITS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes water coils, glycol coils, steam coils, refrigerant coils, electric coils, baseboard radiation, finned tube radiation, convectors, unit heaters, cabinet unit heaters, fan-coil units, unit ventilators, induction Units, radiant heaters and electric heaters.

B. Related Sections:
1. Section 15080 - Mechanical Insulation: Execution requirements for insulation specified by this section.
2. Section 15180 - Heating and Cooling Piping: Execution requirements for piping fittings and drains piping specified by this section.
3. Section 16xxx - Wiring Connections: Execution requirements for electric connection to units specified by this section.
4. Section 16xxx - Motors: Product requirements for motors for placement by this section.

1.2 REFERENCES

A. ARI 410 (Air-Conditioning and Refrigeration Institute) - Forced-Circulation Air-Cooling and Air-Heating Coils.

B. UL 1096 (ANSI/Underwriters Laboratories, Inc.) - Electric Central Air Heating Equipment.

C. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards, Metal and Flexible.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations. Indicate schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers

C. Product Data: Submit coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions. Submit mechanical and electrical service locations, capacities and requirements.

D. Manufacturer's Installation Instructions: Submit assembly, support details, and connection requirements.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access to valves.

C. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of Utah standard.

B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

1.7 PRE-INSTALLATION MEETING

A. Section 01300 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Product storage and handling requirements.

B. Accept units on site in factory packing. Inspect for damage. Store under roof.

C. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors. Protect coils from entry of dirt and debris with pipe caps or plugs.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Section 01700 - Execution Requirements: Product warranties and product bonds.

B. Furnish five-year manufacturer's warranty for fan-coil unit, unit heater and unit ventilator motors.

1.11 EXTRA MATERIALS

A. Section 01700 - Execution Requirements: Spare parts and maintenance products.

B. Furnish two sets of filters.

PART 2 PRODUCTS

2.1 AIR COILS

A. Furnish materials in accordance with State of Utah standards.

2.2 FABRICATION

A. Tubes: ½-inch (12.7 mm) OD seamless copper or brass arranged in parallel or staggered pattern, expanded into fins, silver brazed joints.

B. Fins: Aluminum or copper continuous plate type with full fin collars or individual helical spiral finned tube type wound under tension. Solder coat copper spiral fin coils.

C. Casing: Die formed channel frame of 16 gage (1.8 mm) stainless steel with 3/8 inch (9.5 mm) mounting holes on 3 inch (75 mm) centers. Furnish intermediate center tube supports for plate fin coils longer than 36 inches (900 mm). Furnish intermediate tube supports for spiral fin coils at manufacturer's recommended intervals to eliminate sagging during operation.

D. Capacity: As scheduled.

2.3 WATER HEATING COILS

A. Headers: Cast iron with tubes expanded into header, seamless copper tube with silver brazed joints, or prime coated steel pipe with brazed joints.

B. Leak Testing: Air test under water to 300 psig (2,070 kPa) for working pressure of 200 psig (1,380 kPa) and 220 degrees F (104 degrees C).

C. Configuration: Self-draining circuitry, with threaded plugs in headers for drains and vent; serpentine type with return bends on smaller sizes and return headers on larger sizes.

2.4 GLYCOL HEATING COILS

A. Headers: Cast iron with tubes expanded into header, seamless copper tube with silver brazed joints, or prime coated steel pipe with brazed joints.

B. Leak Testing: Air test under water to 300 psig (2,070 kPa) for working pressure of 200 psig (1,380 kPa) and 220 degrees F (104 degrees C).

C. Configuration: Self-draining circuitry, with threaded plugs in headers for drain and vent and threaded plugs in return bends and in headers opposite each tube.

2.5 WATER COOLING COILS

A. Headers: Cast iron with tubes expanded into header, seamless copper tube with silver brazed joints, or prime coated steel pipe with brazed joints.

B. Leak Testing: Air test under water to 300 psig (2,070 kPa) for working pressure of 200 psig (1,380 kPa) and 220 degrees F (104 degrees C).

C. Configuration: Self draining circuitry, with threaded plugs in headers for drain and vent; threaded plugs in return bends or in headers opposite top and bottom of each tube.

2.6 REFRIGERANT COOLING COILS

A. Headers: Seamless copper or brass tubes with silver brazed joints.

B. Liquid Distributors: Brass or copper venturi or orifice type or removable nozzle type distributor with seamless copper distributor tubes, minimum 1/4 inch (6.4 mm) OD for refrigerant R-22; maximum 12 circuits for each distributor.

C. Leak testing: Air test under water at 450 psig (3,105 kPa) for working pressure of 300 psig (2,070 kPa); dehydrate, and seal with dry air or nitrogen charge.

D. Configuration: Self-draining, down feed with bottom non-oil trapping connection.

2.7 ELECTRIC COILS

A. Furnish materials in accordance with State of Utah standards.

B. Assembly: ANSI/UL 1096 listed and labeled, with terminal control box and hinged cover; splice box, coil, casing, and controls.

C. Coil: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material or Exposed helical coil of nickel-chrome resistance wire with refractory ceramic support bushings.

D. Casing: Die formed channel frame of 16 gage (1.5 mm) galvanized steel with 3/8 inch (9.5 mm) mounting holes on 3 inch (75 mm) centers. Furnish tube supports for coils longer than 36 inches (900 mm).

E. Controls: Automatic reset thermal cut-out, built-in magnetic contactors, control circuit transformer and fuse, manual reset thermal cut-out, air flow proving device, fused disconnect.

2.8 BASEBOARD RADIATION

A. Furnish materials in accordance with State of Utah standards.

B. Heating Elements: 3/4-inch (20 mm) ID copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins, one tube end belled.

C. Enclosure: Minimum 0.030 inch (0.75 mm) steel with 7 inch (175 mm) high back and top of one piece; front panel, end panel, end caps, corners, and joiner pieces to snap together, with front panel easily removable. Furnish full-length damper.

D. Finish: Factory applied baked enamel color.

E. Element Brackets: 0.0516 inch (1.3 mm) galvanized steel to support from panel and noise free element cradle.

F. Capacity: As scheduled, based on 65 degrees F (18 degrees C) entering air temperature.

2.9 FINNED TUBE RADIATION

A. Furnish materials in accordance with State of Utah standards.

B. Heating Elements: 3/4 inch (20 mm) ID seamless copper tubing, mechanically expanded into evenly spaced aluminum fins sized 4 x 4 inches (100 x 100 mm) suitable for soldered fittings.

C. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

D. Enclosures: 0.0478-inch (1.2 mm) thick steel up to 18 inches (450 mm) in height, 0.598 inch (1.5 mm) steel over 18 inches (450 mm) in height or aluminum as detailed, with

easily jointed components for wall-to-wall installation. Support rigidly, on wall or floor mounted brackets at least 3 feet (1000 mm) on center maximum.

E. Finish: Factory applied baked enamel of color.

F. Damper: Where heating media is not thermostatically controlled, furnish knob-operated internal damper at enclosure air outlet.

G. Access Doors: For otherwise inaccessible valves, furnish factory-made permanently hinged access doors, 6 x 7 inch (150 x 175 mm) minimum size, and integral with cabinet.

H. Capacity: As scheduled, based on 180 degrees F (82 degrees C) average water temperature.

2.10 CONVECTORS

A. Furnish materials in accordance with State of Utah standards.

B. Heating Elements: Seamless copper tubing mechanically expanded into evenly spaced aluminum fins and cast iron headers, steel side plates and supports, factory air pressure tested at 100 psi (690 kPa) under water, with means of adjusting pitch of element.

C. Cabinet 0.0598 inch (1.5 mm) thick steel front and top, 0.0478-inch (1.2 mm) steel back and ends; exposed corners rounded; easily secured removable front panels, adequately braced and reinforced for stiffness.

D. Finish: Factory applied baked enamel of color.

E. Damper: Where heating media is not thermostatically controlled, furnish knob-operated internal damper at enclosure air outlet.

F. Access Doors: For otherwise inaccessible valves, furnish factory-made permanently hinged access doors, 6 x 7 inch (150 x 175 mm) minimum size, and integral with cabinet.

G. Capacity: As scheduled, based on 180 degrees F (82 degrees C) average water temperature.

2.11 UNIT HEATERS

A. Furnish materials in accordance with State of Utah standards.

B. Coils: Seamless copper tubing, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.

C. Casing: 0.0478-inch (1.2 mm) thick steel with threaded pipe connections for hanger rods.

D. Finish: Factory applied baked enamel of color.

E. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

F. Air Outlet: Adjustable pattern diffuser on projection models and two-way louvers on horizontal throw models.

G. Motor: Permanently lubricated sleeve bearings on horizontal models, grease lubricated ball bearings on vertical models. Refer to Section 16xxx.

H. Control: Local multi-speed disconnect switch.

I. Capacity: As scheduled, based on 180 degrees F (82 degrees C) average water temperature.

2.12 CABINET UNIT HEATERS

A. Furnish materials in accordance with State of Utah standards.

B. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 100 psi (1380 kPa) and 220 degrees F (104 degrees C).

C. Cabinet: 0.0598-inch (1.5 mm) thick steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation and integral air outlet and integral air outlet and inlet grilles.

D. Finish: Factory applied baked enamel of color on visible surfaces of enclosure or cabinet.

E. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

F. Motor: Tap wound multiple speed [permanent split capacitor] [shaded pole] with sleeve bearings, resiliently mounted.

G. Control: Multiple speed switch, factory wired, located in cabinet.

H. Filter: Easily removed 1-inch (25 mm) thick glass fiber throwaway filter air before coil.

I. Mixing Dampers: Where indicated, mixing sections with dampers. Refer to Section 15985 for operating sequence.

J. Capacity: As Scheduled, based on 180 degrees F (82 degrees C) average water temperature.

2.13 FAN-COIL UNITS

A. Furnish materials in accordance with State of Utah standards.

B. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 200 psi (1380 kPa) and 220 degrees F (104 degrees C). Furnish drain pan under cooling coil, easily removable for cleaning, with drain connection.

C. Cabinet: 0.0598-inch (1.5 mm) thick steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation and integral air outlet and integral air outlet and inlet grilles.

D. Finish: Factory apply baked enamel of color on visible surfaces of enclosure or cabinet.

E. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

F. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

G. Control: Multiple speed switch, factory wired, located in cabinet.

H. Filter: Easily removed 1 inch (25 mm) [thick glass fiber throw-away type, located to filter air before coil.

I. Mixing Dampers: As indicated on Drawings, mixing sections with dampers. Refer to Section 15940 for sequence of operation.

J. Capacity: As indicated on plans.

2.14 UNIT VENTILATORS

A. Furnish materials in accordance with State of Utah standards.

B. Coils: Copper tubes mechanically expanded into evenly spaced aluminum fins tested to operate at 150 psig (1034 kPa). Furnish drain pan under cooling coil, easily removable for cleaning, with drain connection.

C. Electric Heating Coil: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material or Exposed helical coil of nickel-chrome resistance wire with refractory ceramic support bushings.

D. Cabinet: 0.0747-inch (1.9-mm) thick steel on solid base pan with exposed edges rounded. Furnish removable front panels with quick-acting, key-operated cam locks. Furnish removable die-cast or fabricated steel discharge grilles. For units having cooling coils, insulate internal parts and surfaces exposed to conditioned air stream with moisture resistant insulation.

E. Cabinet Accessories: Matching steel construction, reinforced, for use with unit ventilators or finned radiation, with steel alignment pins, adjustable kick plates with leveling bolts, shelves and sliding doors with locks as indicated on Drawings, sinks, bubbler faucets and bowls, corner, end, and wall filler sections.

F. Finish: Factory apply baked enamel of color on visible surfaces of enclosure or cabinet.

G. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven, arranged to draw air through coil.

H. Wall Louvers: Anodized aluminum wall intake box and louvers removable from frame with 1/2-inch (13 mm) square mesh galvanized screen in back of louver.

I. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

J. Air Cooled Condensing Unit: Corrosion resistant cabinet, with hermetically sealed compressor with internal spring isolation, external isolation, permanent split capacitor motor and overload protection, copper tube aluminum fin condenser coil, direct drive propeller fan with permanently lubricated ball bearing single phase motor with internal overload protection.

K. Control: Multiple speed switch, factory wired, located in cabinet.

L. Filter: Easily removed 1-inch (25 mm) thick glass fiber throwaway type, located to filter air before coil.

M. Mixing Dampers: Multi-blade with compressible seal, capable of varying proportion of mixed air from 100 percent room air to 100 percent outside air.

N. Heating Capacity: As indicated on Drawings.

2.15 HYDRONIC RADIANT HEATERS

A. Furnish materials in accordance with State of Utah standards.

B. Ceiling Panels: Constructed of modular 24 x 48 inch (600 x 1200 mm) aluminum pans with silk-screened pattern matching ceiling tile; manufactured and assembled to sizes and configurations indicated.

C. Pipe Coil: 6 inch (150 mm)] module to incorporate extruded void into continuous 1/2 inch (15 mm) copper pipe is rolled and thermally bonded. Furnish return bends for two water connections to each panel.

D. As indicated on Drawings, furnish panels incorporating extruded drapery track.

E. Cross brace entire assembly with structural members and insulate with 1-inch (25 mm) thick fiberglass insulation. Configure panels within T-bar ceiling module and run wall to wall.

F. Heating Capacity: As scheduled, based on 180 degrees F (82 degrees C) average water temperature, 70 degrees F (21 degrees C) space temperature.

2.16 ELECTRIC RADIANT HEATERS

A. Furnish materials in accordance with State of Utah standards.

B. Assembly: UL listed and labeled, with thermal box and cover, and built-in controls.

C. Heating Elements: Enclosed copper tube element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material.

D. Ceiling Panels: 24 x 48 inch (609 x 1219 mm) aluminum pans with silk-screened pattern matching ceiling tile; manufactured and assembled to configuration indicated.

2.17 ELECTRIC BASEBOARD

A. Furnish materials in accordance with State of Utah standards.

B. Assembly: UL listed and labeled with terminal box and cover, and built-in controls.

C. Heating Elements: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material.

D. Enclosure: Minimum 0.030 inch (0.75 mm) thick steel with high back and top of one piece; front panel, end panel, end caps, corners, and joiner pieces to snap together, and front panel easily removable. Furnish full-length damper.

E. Control: Built-in bi-metal heating thermostat, factory wired.
1. Refer to Section 16xxx.

2.18 ELECTRIC UNIT HEATERS

A. Furnish materials in accordance with State of Utah standards.

B. Assembly: UL listed and labeled assembly with terminal box and cover, and [built-in] controls.

C. Heating Elements: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material or Exposed helical coil of nickel-chrome resistance wire with refractory ceramic support bushings.

D. Cabinet: 0.0478-inch (1.2 mm) thick steel with easily removed front panel with integral air outlet and inlet grilles.

E. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

F. Fan: Direct-drive propeller type, statically and dynamically balanced, with fan guard.

G. Motor: Permanently lubricated, sleeve bearings for horizontal models; ball bearings for vertical models.

H. Control: Separate fan speed switch and thermostat heat selector switch, factory wired, with switches built-in behind cover. Furnish thermal overload.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify wall construction and ductwork are ready for installation.

C. Verify concealed blocking and supports are in place and connections are correctly located.

3.2 INSTALLATION

A. Install Work in accordance with authority State of Utah standards.

B. Install coils in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible.

C. Support coil sections independent of piping on steel channel or double angle frames and secure to casings. Furnish frames for maximum three coil sections. Arrange supports to avoid piercing drain pans. Install with airtight seal between coil and duct or casing.

D. Protect coils to prevent damage to fins and flanges. Comb out bent fins.

E. Install coils level. Install cleanable tube fluid coils and level frame steam coils with 1:50 pitch.

F. Make connections to coils with unions and flanges.

G. On water coils, install shut-off valve on supply piping and lockshield balancing valve on return piping. Locate water supply at bottom of supply header and return water connection at top. Install manual air vents at high points complete with stop valve. Install water coils to be drainable and install drain connection at low points.

H. On water and glycol heating coils, and chilled water-cooling coils, connect water supply piping to leaving airside of coil (counter flow arrangement).

I. For cooling coils where air velocity exceeds 500 ft/min (2.5 m/sec), install three break moisture eliminators of 24 gage (0.60 mm) galvanized steel.

J. Install drain pan and drain piping connection for cooling coils. Fabricate drain pan from 20 gage (0.90 mm) galvanized steel. Extend 3 inches (75 mm) from face of coil entering airside, 6 inches (150 mm) from face of coil leaving airside, and 4 inches (100 mm) from face of eliminators. Pipe drain pans individually to floor drain with water seal trap.

K. In steam coils, install vacuum breaker in steam piping at or in header. Install steam traps with outlet minimum 12 inches (300 mm) below coil return connection.

L. On refrigerant coils, install sight glass in liquid piping within 12 inches (300 mm) of coil.

M. Insulate headers located outside airflow as specified for piping. Refer to Section 15080.

N. Wire electric duct coils. Refer to Section 16xxx.

O. Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.

P. Protection: Install finished cabinet units with protective covers during remainder of construction.

Q. Baseboard Radiation: Locate on outside walls and run cover continuously wall-to-wall unless otherwise indicated. Center elements under windows. Where multiple windows occur over units, divide element into equal segments centered under each window. Install end caps where units butt against walls.

R. Finned Tube Radiation: Locate on outside walls and run cover wall-to-wall unless otherwise indicated. Center elements under windows. Where multiple windows occur over units, divide element into equal segments centered under each window. Align cabinet joints with window mullions. Install wall angles where units butt against walls.

S. Convectors: Install at locations as indicated on Drawings. Coordinate to assure correct recess size for recessed convectors.

T. Unit Heaters: Hang from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

U. Cabinet Unit Heaters: Install at locations as indicated on Drawings. Coordinate to assure correct recess size for recessed units.

V. Fan-Coil Units: Install at locations as indicated on Drawings. Coordinate to assure correct recess size for recessed units.

W. Unit Ventilators: Install at locations as indicated on Drawings. Install level and shim units, and anchor to structure. Coordinate exact location of wall louvers. Install shelving and auxiliary cabinetry. Install wall trim pieces for continuous wall-to-wall installation.

X. Induction Units: Install at locations as indicated on Drawings. Support base units from continuous wall mounting strip or wall mounting brackets. Support cabinet enclosures from wall mounting strip or attach direct to wall and floor.

Y. Hydronic Units: Install with shut-off valve on supply piping and lockshield balancing valve on return piping. Where not accessible, extend vent to exterior surface of cabinet for

servicing. For cabinet unit heaters, fan coil units, and unit heaters, install float operated automatic air vents with stop valve.

Z. Units with Cooling Coils: Install drain piping to condensate drain.

AA. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals and Section 16xxx.

3.3 CLEANING

A. Section 01700 - Execution Requirements: Final cleaning.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

D. Install new filters.

3.4 SCHEDULES as per plans.

END OF SECTION

SECTION 15810

DUCTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes metal ductwork, nonmetallic ductwork, casing and plenums, buried ductwork, duct cleaning.

B. Related Sections:
1. Section 15060 – Hangers and Supports: Product requirements for hangers, supports and sleeves for placement by this section.

1.2 REFERENCES

A. ASTM A36 - Structural Steel.

B. ASTM A90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.

C. NFPA 90A (National Fire Protection Association) - Installation of Air Conditioning and Ventilating Systems.

D. NFPA 90B (National Fire Protection Association) - Installation of Warm Air Heating and Air Conditioning Systems.

E. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - HVAC Air Duct Leakage Test Manual.

F. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards - Metal and Flexible.

G. UL 181 (Underwriters Laboratories, Inc.) - Factory-Made Air Ducts and Connectors.

1.3 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is permitted except by written permission. Size No round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.4 SUBMITTALS

A. Provide in accordance with the General Conditions of the Contract.

B. Test Reports: Indicate pressure tests performed. Include date; section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.

B. Construct ductwork to NFPA 90A and NFPA 90B standards.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures during and after installation of duct sealant.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 WARRANTY

A. Furnish 1-year manufacturer warranty for ducts.

PART 2 PRODUCTS

2.1 DUCT MATERIALS

A. Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having G60, G90 zinc coating of in conformance with ASTM A90.

B. Steel Ducts: ASTM A366, A569, and A568.

C. Fasteners: Rivets, bolts, or sheet metal screws.

D. Hanger Rod: ASTM A36; steel, galvanized threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings. Furnish duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4-inch (100 mm) cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.

2.3 INSULATED FLEXIBLE DUCTS:

A. Manufacturers: Flex Master

B. Two ply vinyl film supported by helical wound spring steel wire, fiberglass insulation and polyethylene vapor barrier film. Maximum length allowed at point of 5 ft.
1. Pressure Rating: 10 inches wg (2.50 kPa) positive and 1.0 inches wg (250 Pa) negative.
2. Maximum Velocity: 4000 fpm (20.3 m/sec).
3. Temperature Range: -10 degrees F to 160 degrees F (-23 degrees C to 71 degrees C).

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify sizes of equipment connections before fabricating transitions.

3.2 INSTALLATION

A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

C. Use crimp joints with or without bead or beaded sleeve couplings for joining round duct sizes 8 inches and smaller.

D. Use double nuts and lock washers on threaded rod supports.

E. Connect flexible ducts to metal ducts with draw bands.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Install openings in ductwork where required to accommodate thermometers and controllers. Install Pitot tube openings for testing of systems. Install pitot tube complete with metal can with spring device or screw to prevent air leakage. Where openings are provided in insulated ductwork, install insulation material inside metal ring.

3.4 CLEANING

A. Section 01700 - Execution Requirements: Final cleaning.

B. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient airflow, clean one half of system completely before preceding to other half. Protect equipment with potential to be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.5 SCHEDULES

DUCTWORK MATERIAL SCHEDULE

AIR SYSTEM	MATERIAL
Supply (Heating Systems)	Galvanized, Steel, Aluminum,
Supply (System with Cooling Coils)	Galvanized, Steel, Aluminum,
Return and Relief	Galvanized, Steel, Aluminum
General Exhaust	Galvanized, Steel, Aluminum

END OF SECTION

SECTION 15820

DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes back-draft dampers, combination fire-and-smoke dampers, duct access doors, fire dampers, smoke dampers, volume control dampers, flexible duct connections and duct test holes.

B. Related Sections:
1. Division 16 - Wiring Devices: Execution requirements for connection of electrical Combination Smoke and Fire Dampers specified by this section.
2. Section 15905 - HVAC Instrumentation: Execution and Product requirements for connection and control of Combination Smoke and Fire Dampers for placement by this section.

1.2 REFERENCES

A. NFPA 90A (National Fire Protection Association) - Installation of Air Conditioning and Ventilating Systems.

B. NFPA 92A (National Fire Protection Association) - Smoke Control Systems.

C. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards - Metal and Flexible.

D. UL 33 (Underwriters Laboratories, Inc.) - Heat Responsive Links for Fire-Protection Service.

E. UL 555 (Underwriters Laboratories, Inc.) - Fire Dampers and Ceiling Dampers.

F. UL 555S (Underwriters Laboratories, Inc.) - Leakage Rated Dampers for Use in Smoke Control Systems.

1.3 SUBMITTALS

A. Provide in accordance with the General conditions of the Drawings.

B. Product Data: Submit data for shop fabricated assemblies including volume control dampers duct access doors and hardware used. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Submit for Fire and Combination Smoke and Fire Dampers.

1.4 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of access doors and test holes.

C. Operation and Maintenance Data: Submit for Combination Smoke and Fire Dampers.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.7 COORDINATION

A. Coordinate Work where appropriate with building control Work.

PART 2 PRODUCTS

2.1 COMBINATION FIRE AND SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A, UL 555, and UL 555S.

B. Multiple-Blade Dampers: Fabricate with 16 gage (1.5 mm) galvanized steel frame and blades. Furnish oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2 inch (3.2 x 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.

C. Operators: UL listed and labeled spring return electric type suitable for 120 volts, single phase, 60 Hz. Furnish end switches to indicate damper position. Locate damper operator on exterior of duct and link to damper operating shaft.

D. Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening by gravity upon actuation of Electro thermal link, flexible stainless steel blade edge seals to produce constant sealing pressure.

E. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of Electro thermal link, flexible stainless steel blade edge seals to produce constant sealing pressure, stainless steel springs with locking devices.

F. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.2 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish minimum 1-inch (25 mm) thick insulation with sheet metal cover.
   1. Less Than 12 inches (300 mm) square, secure with sash locks.
   2. Up to 18 inches (450 mm) Square: Furnish two hinges and two sash locks.
   3. Up to 24 x 48 inches (600 x 1200 mm): Three hinges and two compression latches.
   4. Larger Sizes: Furnish additional hinge.
   5. Access panels with sheet metal screw fasteners are not acceptable.

2.3 FIRE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555, and manufacturer's condition of listing. Permanently mark dampers for use in static systems.

B. Horizontal Dampers: Galvanized steel, 22 gage (0.76 mm) frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

C. Curtain Type Dampers: Galvanized steel with interlocking blades. Furnish stainless steel closure springs and latches for horizontal installations conditions. Configure with blades out of air stream except for 1.0-inch 250 Pa pressure class ducts up to 12 inches (300 mm) in height.

D. Multiple Blade Dampers: 16 gage (1.5 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles; 1/8 x 1/2 inch (3.2 x 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

E. Fusible Links: UL 33, separate at 160 with adjustable link straps for combination fire/balancing dampers.

2.4 VOLUME CONTROL DAMPERS.

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.

B. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch (200 x 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware.

C. End Bearings: Except in round ductwork 12 inches and smaller, furnish end bearings. On multiple blade dampers, furnish oil-impregnated nylon or sintered bronze bearings. Furnish closed end bearings on ducts having pressure classification over 2 inches wg.

D. Quadrants:
1. Furnish locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches (750 mm) furnish regulator at both ends.

2.5 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.

B. Connector: Fabric crimped into metal edging strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 30 oz per sq yd.
2. Net Fabric Width: Approximately 3 inches wide.
3. Metal: 3 inch wide, 24 gages galvanized steel.

2.6 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated airtight flanged fittings with screw cap. Furnish extended neck fittings to clear insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify rated walls are ready for fire damper installation.

B. Verify ducts and equipment installation are ready for accessories.

3.2 INSTALLATION.

A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 15810 for duct construction and pressure class.

B. Install duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and as indicated on Drawings. Install minimum 8 x 8 inch (200 x 200 mm) size for hand access, 18 x 18 inch (450 x 450 mm) size for shoulder access, and as indicated on Drawings. Install 4 x 4 inch (100 x 100 mm) for balancing dampers only. Review locations prior to fabrication.

C. Install duct test holes required for testing and balancing purposes.

D. Provide fire dampers, combination fire and smoke dampers at locations as indicated on Drawings. Install with required perimeter mounting angles, sleeves, and breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

E. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.

3.3 DEMONSTRATION AND TRAINING

A. Demonstrate re-setting of fire dampers to Owner's representative.

END OF SECTION

SECTION 15830

FANS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes roof exhausts fans, cabinet fans, ceiling exhaust fans, backward inclined centrifugal fans, forward curved centrifugal fans, airfoil centrifugal fans, radial centrifugal fans, tubular centrifugal fans, in-line centrifugal fans, vent sets, vane axial fans, propeller fans, motors, drives and accessories.

B. Related Sections:
1. Section 15070 – Mechanical Sound, Vibration, and Seismic Control: Product requirements for resilient mountings and snubbers for fans for placement by this section.
2. Section 15080 – Mechanical Insulation: Product requirements for power ventilators for placement by this section.
3. Section 15810 - Ducts: Product requirements for hangers for placement by this section.
4. Section 15820 Duct Accessories: Product requirements for Back-draft Dampers for placement by this section.

1.2 REFERENCES

A. ABMA STD 9 (American Boiler Manufacturers Association) - Load Ratings and Fatigue Life for Ball Bearings.

B. ABMA STD 11 (American Boiler Manufacturers Association) - Load Ratings and Fatigue Life for Roller Bearings.

C. AMCA 99 (Air Movement and Control Association) - Standards Handbook.

D. AMCA 210 (Air Movement and Control Association) - Laboratory Methods of Testing Fans for Rating.

E. AMCA 300 (Air Movement and Control Association) - Reverberant Room Method for Sound Testing of Fans.

F. AMCA 301 (Air Movement and Control Association) - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

G. NEMA MG1 (National Electrical Manufacturers Association) - Motors and Generators.

H. UL 705 (Underwriters Laboratories, Inc.) - Power Ventilators.

1.3 SUBMITTALS

A. Section 15010.

B. Shop Drawings: Indicate size and configuration of fan assembly, mountings, weights, ductwork, and accessory connections.

C. Product Data: Submit data on fans and accessories including fan curves with specified operating point plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

D. Test Reports: Indicate performance data for adjustable axial fan blades for at least five blade settings, including maximum.

E. Manufacturer's Installation Instructions: Submit fan manufacturer's instructions.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing. Work of this section with minimum three years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not operate fans for until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

1.8 WARRANTY

B. Furnish 1-year manufacturer warranty for fans.

1.9 MAINTENANCE SERVICE

A. Execution Requirements: Maintenance service

B. Furnish service and maintenance of fans for one year from Date of Substantial Completion.

1.10 EXTRA MATERIALS

A. Furnish one set of belts for each fan.

PART 2 PRODUCTS

2.1 CENTRIFUGAL FANS

A. Manufacturers:
1. Loren Cook Co.
2. Penn
3. Greenheck Corp.

4. Twin City

B. Performance
1. Performance Ratings: Conform to AMCA 210 and bear AMCA Certified Rating Seal.
2. Sound Ratings: AMCA 301, tested to AMCA 300 and bear AMCA Certified Sound Rating Seal.
3. Fabrication: Conform to AMCA 99
4. Performance Base: 4200 feet conditions.
5. Temperature Limit: Maximum 300 degrees F (150 degrees C).
6. Static and Dynamic Balance: Eliminate vibration or noise transmission to occupied areas.

C. Wheel and Inlet
1. Backward Inclined: Steel or aluminum construction with smooth curved inlet flange, back plate, backward curved blades welded or riveted to flange and back plate; cast iron hub riveted to back plate and keyed to shaft with set screws.
2. Forward Curved: Black enamel steel construction with inlet flange, back plate, shallow blades with inlet and tip curved forward in direction of airflow, mechanically secured to flange and back plate; steel hub swaged to back plate and keyed to shaft with set screw.
3. Airfoil Wheel: Steel construction with smooth curved inlet flange, back plate die formed hollow airfoil shaped blades continuously welded at tip flange, and back plate; cast iron hub riveted to back plate and keyed to shaft with set screws.
4. Radial: Steel construction with inlet flange back plate, plate blades with reinforcing gussets and wearing strips welded or riveted to back plate and keyed to shaft with setscrews.

D. Housing
1. Steel, spot welded for AMCA 99 Class I and II fans, and continuously welded for Class III, braced, designed to minimize turbulence with spun inlet bell and shaped cut-off.
2. Bolted construction with horizontal split housing.
3. Fabricate plug fans without volute housing, in lined steel cabinet. Refer to Section 15290.

E. Bearings and Sleeves
2. Bearings: pillow block type, self-aligning, grease-lubricated ball bearings, with ABMA 9 L-10 life at 50,000 hours.
3. Shafts: Hot rolled steel, ground and polished, with key way, protectively coated with lubricating oil, and shaft guard.
4. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, keyed. Variable and adjustable pitch sheaves for motors 15 hp (11.2 kW) and under, selected so required rpm is obtained with sheaves set at mid-position. Fixed sheave for 20 hp (15kW) and over, matched belts, and drive related as recommended by manufacturer or minimum 1.5 times nameplate rating of motor.
5. Belt Guard: Fabricate to SMACNA Standard; 0.106 inch (2.6 mm) thick, ¾ inch (20 mm) diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

2.2 ROOF EXHAUSTERS

A. Manufacturers:
1. Penn
2. Twin City
3. Cook

4. Greenheck

B. Product Requirements:
1. Performance Ratings: Conform to AMCA 210 and bear AMCA Certified Rating Seal.
2. Sound Ratings: AMCA 301, tested to AMCA 300.
3. Fabrication: Conform to AMCA 99.
4. UL Compliance: UL listed and labeled, designed, manufactured and tested in accordance with UL 705.

C. Construction
1. Fan Unit: V-belt with spun aluminum up blast spun aluminum with grease tray housing; resilient mounted motor; ½ inch (13 mm) mesh, 0.62-inch (1.6 mm) thick aluminum wire bird screen; square base to suit roof curb with continuous curb gaskets.
2. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

D. Accessories
1. Roof Curb: galvanized steel aluminum with continuously welded seams, one-inch (25 mm) insulation and curb bottom, interior baffle with acoustic insulation, curb bottom and factory installed nailer strip.
2. Disconnect Switch: Factor-wired, non-fusible, in housing for thermal overload protected motor.
3. Back-draft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, and blades linked.

2.3 CABINET AND CEILING EXHAUST FANS

A. Manufacturers:
1. Penn
2. Twin City
3. Cook
4. Greenheck

B. Construction.
1. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with ½ inch (13 mm) acoustic insulation, resilient mounted motor, gravity back-draft damper in discharge.
2. Disconnect Switch: Cord and plug in housing for thermal overload protected motor.
3. Grille: Baked white enamel finish.
4. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearing.

PART 3 EXECUTION

3.1 SCHEDULES

A. See drawings.

END OF SECTION

SECTION 15850

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes diffusers, registers/grilles, louvers, louvered penthouses, and roof hoods.

1.2 REFERENCES

A. ADC 1062 (Air Diffusion Council) - Certification, Rating and Test Manual.

B. AMCA 500 (Air Movement and Control Association) - Test Method for Louvers, Dampers and Shutters.

C. ASHRAE 70 (American Society of Heating, Refrigerating and Air Conditioning Engineers) - Method of Testing for Rating the Airflow Performance of Outlets and Inlets.

D. SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) - HVAC Duct Construction Standard - Metal and Flexible.

1.3 SUBMITTALS

A. Provide as per the General Conditions.

B. Product Data: Submit data outlets and inlets sizes, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.1 CEILING SLOT DIFFUSERS

A. Manufacturers: Titus, Price, Tempmaster, and Tempo.

B. Type: As scheduled on the Drawings

C. Fabrication: Aluminum extrusions with factory baked enamel finish, color to be selected.

D. Frame: 1-1/4 inch margin with countersunk screw support clips for suspension system support clips for T bar mounting and gasket coordinate with ceiling type as shown on Architectural Drawings.

E. Plenum: Integral, galvanized steel, insulated.

2.2 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES (PERFORATED FACE)

A. Manufacturers: Titus, Anemostat, Krueger, and Price.

B. Type: Perforated and removable face as scheduled on the Drawings.

C. Coordinate mounting frame with ceiling type indicated on the Drawings.

D. Fabrication: Steel with steel or aluminum frame.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify inlet/outlet locations.

B. Verify ceiling and wall systems are ready for installation.

3.2 INSTALLATION

A. Install diffusers to ductwork with airtight connection.

B. Install balancing dampers on duct take-off to diffusers, grilles, and registers, whether or not dampers are furnished as part of diffuser, grille, and register assembly.

C. Paint visible portion of ductwork behind air outlets and inlets matte black.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

3.4 SCHEDULES

END OF SECTION

SECTION 15950

TESTING, ADJUSTING AND BALANCING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes testing, adjusting, and balancing of air systems, testing, adjusting, and balancing of hydronic systems, measurement of final operating condition of HVAC systems, sound measurement of equipment operating conditions, vibration measurement of equipment operating conditions.

1.2 REFERENCES

A. AABC (Associated Air Balance Council) - National Standards for Total System Balance.

B. ASHRAE 111 (American Society of Heating, Refrigerating and Air-Conditioning Engineers) - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.

C. NEBB (National Environmental Balancing Bureau) - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

1.3 SUBMITTALS

A. Provide in accordance with the General Conditions of the Contract.

B. Test Reports: Indicate data on AABC National Standards for Total System Balance forms or NEBB Report forms.

C. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

D. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

E. Submit draft copies of report for review prior to final acceptance of Project. Furnish final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.

F. Furnish reports in 3-ring binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

G. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty and Copy of NEBB Certificate of Conformance Certification prior to commencing system balance.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of flow measuring stations balancing valves and rough setting.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems

B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this section with minimum three years documented experience certified by AABC or Certified by NEBB.

B. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor.

1.7 SEQUENCING

A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.8 SCHEDULING

A. Schedule and provide assistance in final adjustment and test of life safety system with Fire Authority.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify systems are complete and operable before commencing work. Verify the following:
1. Systems are started and operating in safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place or in normal position.
15. Service and balancing valves are open.

B. Submit field reports. Report defects and deficiencies noted during performance of services, preventing system balance.

3.2 PREPARATION

A. Furnish instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.3 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

A. Verify recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner.

F. Check and adjust systems approximately six months after final acceptance and submit report.

3.5 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to obtain required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts.

E. Use volume control devices to regulate air quantities only to extent adjustments do not create objectionable air motion or sound levels. Effect volume control by using volume dampers located in ducts.

F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. At modulating damper locations, take measurements and balance at extreme conditions. Balance variable volume systems at maximum airflow rate, full cooling, and at minimum airflow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to obtain required relationship between each to maintain approximately 0.05 inches positive static pressure near building entries.

M. On fan powered VAV boxes, adjust airflow switches for proper operation.

3.6 WATER SYSTEM PROCEDURE

A. Adjust water systems, after air balancing, to obtain design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow-metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in system.

C. Adjust systems to obtain specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open or in normal position to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts simulate full flow in one part by temporary restriction of flow to other parts.

END OF SECTION

Section 16001	**Electrical General Provisions**
Section 16060	**Grounding and Bonding**
Section 16070	**Electrical Hangers and Supports**
Section 16075	**Electrical Identification**
Section 16123	**Building Wire and Cable**
Section 16129	**Electric Heat Roof Gutter Snow Melting System**
Section 16130	**Raceway and Boxes**
Section 16140	**Wiring Devices General**
Section 16210	**Electrical Utility Switches**
Section 16261	**Uninterruptible Power Supply**
Section 16411	**Enclosed Switches**
Section 16421	**Enclosed Controllers**
Section 16442	**Panelboards**
Section 16510	**Interior Luminaires**
Section 16520	**Exterior Luminaires**
Section 16740	**Telephone Data Raceway System**
Section 16835	**Closed Circuit Television and Digital Recording System**
Section 16900	**Fire Alarm Detection System**
Section 16910	**Building Security System**

SECTION 16001

ELECTRICAL GENERAL PROVISIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and ALL other sections of Division 16

B. Equipment requiring rough-ins and/or connections by Division 16 may be shown on the architectural drawings and/or specified in Sections 1 through 15 Division 16 is responsible for these rough-ins and/or connections whether shown on the electrical drawings or not.

1.2 SUMMARY

A. This Section includes general administrative and procedural requirements for electrical installations.
1. Product Substitutions.
2. Coordination Drawings.
3. Record Drawings and documentation.
4. Delivery, storage and handling.
5. Rough-ins
6. Electrical installations.
7. Cutting and patching.

1.3 QUALITY ASSURANCE:

A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies refers to the **latest edition** of such publications adopted and published prior to submittal of the bid proposed, unless noted otherwise herein. Such codes or standards are considered a part of this specification as though fully repeated herein.

B. When codes, standards, regulations, etc. allow work of lesser quality or extent than is specified under this Division, nothing in said codes shall be construed or inferred as reducing the quality, requirements or extent of the Drawings and Specifications. Perform work in accordance with applicable requirements of all governing codes, rules and regulations including the following minimum standards, whether statutory or not:

1. National Electric Code (NEC).
2. International Building Code (IBC).
3. International Fire Code (IFC).
4. International Mechanical Code (IMC).

C. Standards: Comply with the following standards where applicable for equipment and materials specified under this Division.

UL Underwriters' Laboratories

ASTM	American Society for Testing Materials
CBN	Certified Ballast Manufacturers
IPCEA	Insulated Power Cable Engineers Association
NEMA	National Electrical Manufacturer's Association
ANSI	American National Standards Institute
ETL	Electrical Testing Laboratories

All electrical apparatus furnished under this Section shall conform to (NEMA) standards and the NEC and bear the Underwriters' Laboratories (UL) label where such label is applicable.

Comply with requirements of State and Local Ordinances. If a conflict occurs between these requirements and the Contract Documents, the most stringent requirements shall govern. The Contractor accepts this responsibility upon submitting his bid, and no extra charge will be allowed after the contract is awarded. This shall not be construed as relieving the Contractor from complying with any requirements of the Contract Documents which may be in excess of the aforementioned requirements, and not contrary to same.

Obtain all permits, inspections, etc. required by authority having jurisdiction. Include all fees in bid. Furnish a certificate of approval to the Owner's Representative from the Inspection Authority at completion of the work.

Employ only qualified craftsmen with at least three years of experience. Workmanship shall be neat, have a good mechanical appearance and conform to best electrical construction practices. Provide a competent superintendent to direct the work at all times. Any person found incompetent shall be discharged from the project and replaced by satisfactory personnel.

Contractor shall have a current state contracting license applicable to type of work to be performed under this contract.

1.4 PRODUCT SUBSTUTIONS

A. Substitutions will be considered by submitting a duplicate written application (2-copies) to the offices of the Architect and Engineer five (5) working days prior to the day of the bidding. The application shall include:
   1. A statement certifying that the proposed equipment proposed is equal to that specified; that it has the same electrical and physical characteristics, compatible dimensions, and meets the functional intent of the contract documents.
   2. The specified and submittal catalog numbers of the equipment under consideration;
   3. A pictorial and specification cut sheet or brochure.

B. All conflicts that arise from the use of substituted equipment shall be the responsibility of the Contractor, who shall bear all costs required to make the equipment comply with the intent of the contract documents or replace equipment with specified products.

1.5 SHOP/COORDINATION DRAWINGS

A. Prepare shop/coordination drawings which include product data cut sheets, performance data, wiring diagrams, dimensions, spatial/maintenance needs, etc along with 1/8” or

larger detailed shop drawings as applicable denoting electrical equipment and materials in relationship with other systems, installations and building components. Coordinate with Division 15. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the work, including but not limited to the following:

1. Indicate the proposed locations of equipment, motor controllers, disconnects, duct smoke detectors, control panels and control devices. Include the following:

    a. Control diagrams
    b. Clearances for servicing and maintaining equipment and space for equipment disassembly required for periodic maintenance.
    c. Equipment connections and support details
    d. Exterior wall and foundation penetrations.
    e. Fire rated wall and floor penetrations. (refer to architectural plans)
    f. Sizes and locations of required concrete pads and bases.

2. Indicate scheduling, sequencing, movement and positioning of large equipment in the building during construction.
3. Prepare floor plans, elevations and details to indicate penetrations in floors, walls and ceilings and their relationship to other penetrations and installations.
4. Coordinate “Lighting Fixture Schedule closely with architectural reflected ceiling plans. If device types shown on the electrical plans conflict with the architectural reflected ceiling plans, Architect shall be advised of discrepancies prior to fixture installation.

1.6 RECORD DRAWINGS/DOCUMENTS

A. Prepare record documents that indicate the following installed conditions.
    1. Equipment locations dimensioned from prominent building lines.
    2. Approved substitutions, Contract modifications and actual equipment and materials installed.
    3. Contract modifications , actual equipment and materials installed.
    4. All circuit designations as installed.
    5. All underground electrical lines.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades compliance labels and other information needed for identification.

B. Handle carefully to prevent damage. Following manufacture’s written instructions foe rigging. Replace damaged products.

C. Store in clean dry place off the ground. Protect from weather, water and physical damage.

1.8 SYSTEMS PRE-INSTALLATION COORDINATION MEETING:

A. **Electrical Contractor** shall schedule a systems pre installation coordination meeting to review all systems rough-ins, requirements and coordination between systems contractors and trades. Meeting shall be scheduled before equipment rough-ins are made and after all shop drawings have been submitted, reviewed and returned. The following persons shall be present at the pre-installation coordination meeting.

1. DFCM Project Manager
2. Project Architect
3. General Contractor Site Forman and Project Manager
4. Electrical Contractor Site Forman and Project Manager
5. Project Electrical Engineer
6. Fire Alarm /Security contractor
7. CCTV System contractor
8. ABC Security Director
9. State Department of Information Technology
10. Central Station company representative

1.9 GUARANTEE: Electrical Contractor and his sub contractors under this contract shall ensure that the electrical systems and sub systems are in proper working order and in compliance with the drawings, specifications, and/or authorized changes. Without additional charge the contractor shall replace any work or materials which develop defect, except from ordinary wear and tear, within one year from the date of substantial completion. Exception: Incandescent and fluorescent lamps shall be guaranteed for a period of two months from the date of substantial completion.

PART 2 PRODUCTS

A. Products are as specified by manufacturer name, description, and/or catalog number. Discrepancies between equipment specified and the intended function of equipment shall be brought to the attention of the Architect/Engineer in writing prior to bidding. Failure to report any conflict, including catalog numbers, discontinued products, etc., does not relieve the Contractor from meeting the intent of the contract documents nor shall it change the contract cost. If the Contractor is unable to interpret any part of the plans and/or specifications, or should he find discrepancies therein, he shall bring this to the attention of the Architect/Engineer who will issue interpretation and/or additional instructions to Bidders before the project is bid.

B. Manufacturers: Furnish and install electrical products from manufacturers as specified or accepted through methods specified here-in. The manufacturers descriptions and catalog numbers are to establish basic product quality required. Substitutions will be considered by submitting a duplicate written application (2-copies) to the offices of the Architect and Engineer five (5) working days prior to the day of the bidding. The application shall include the following: 1) A statement certifying that the equipment proposed is equal to that specified; that it has the same electrical and physical characteristics, compatible dimensions, and meets the functional intent of the contract documents; 2) The specified and submittal catalog numbers of the equipment under consideration; 3) A pictorial and specification brochure.

C. Any conflict arising from the use of substituted equipment shall be the responsibility of the Contractor, who shall bear all costs required to make the equipment comply with the intent of the contract documents.

D. Samples may be required for non-standard or substituted items before installation during construction. Provide all samples as required.

E. No materials or apparatus may be substituted after the bid opening except where the equipment specified has been discontinued.

F. Provide only equipment specified in the Contract Documents or approved by addendum.

G. Provide spare parts (fuses, diffusers, lamps, etc.) as specified. Transmit all spare parts to Owner's Representative prior to substantial completion.

PART 3 - EXECUTION

3.1 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements, equipment requiring rough-in by Division 16 may be specified in sections other the Division 16.

C. Refer to architectural, civil, mechanical, security, telecommunications, kitchen, laundry etc drawings for equipment not shown on the Division 16 drawings that may require electrical connections by Division 16.

3.2 ELECTRICAL INSTALLATIONS

A. General: Sequence, coordinate and integrate the various elements of electrical systems, materials and equipment. Comply with the following requirements:
1. Coordinate electrical systems, equipment and materials installations with other build components.
2. Verify all dimensions by field measurement.
3. Arrange for chases, slots and openings in other building components during progress of construction, to allow for electrical installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in place concrete and other structural components, as they are constructed.
5. Coordinate the installation of 4” concrete housekeeping pads for all floor mounted electrical equipment. Pads shall be 4” deep and 6” larger in each dimension than the equipment. Concrete requirements are as specified in Division 3.
6. Sequence, coordinate and integrate installations of electrical materials and equipment for efficient flow of work. Give particular attention to large equipment requiring positioning prior to closing in the building.
7. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.
8. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies and controlling agencies. Provide required connection for each service.
9. Install systems, materials and equipment to conform with approved submitted data, including coordination drawings, to the greatest extent possible. Conform to arraignments indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual systems requirement, refer conflict to Engineer. Maintain manufacture’s recommended clearances.

10. Install systems, materials level and plumb, parallel ad perpendicular to other building systems and components, where installed expose in finished spaces.
11. Install electrical equipment to facilitate servicing maintenance and repair of replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations.

    a. Comply with working clearances identified in Article 110-26 2005 NEC and coordinate with Division 15 subcontractor to insure that no piping, ductwork or equipment is installed in the exclusively dedicated space for switchboards or panelboards within the scope of Article 384.

12 Install access panel or doors where equipment is concealed behind finished surfaces.
13 Install systems, materials and equipment giving right-of-way priority to systems required to be install at a specific slope.
14 All penetrations of fire rated partitions by electrical services shall be fire stopped as required by the specifications and local codes. Refer to architectural drawings for locations of fire rated partitions.

3.3 DEMOSTRATIONS

A. Provide start-up services and instruct Owners personnel if operation and maintenance of major items of equipment.

B. Start-up equipment, only in accordance with manufacture's written instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

C. Train Owner's personnel on start-up and shut-down procedures, troubleshooting procedures, servicing ad preventive maintenance scheduled procedures. Review with Owner' personnel the data contained in the Operating and Maintenance Manuals specified in this specification.

3.4 CUTTING AND PATCHING

A. General: Perform all cutting and patching in accordance with Division 1.

END OF SECTION

SECTION 16060

GROUNDING AND BONDING

GENERAL

1.1 SUMMARY

A. Section Includes:
1. Rod electrodes.
2. Active electrodes.
3. Wire.
4. Grounding well components.
5. Mechanical connectors.
6. Exothermic connections.
7. Concrete encased electrode (UFER ground)

B. Related Sections:
1. Section 02590 - Site Grounding: Site related grounding components for buildings and facilities.
2. Section 03200 - Concrete Reinforcement: Bonding or welding bars when reinforcing steel is used for electrodes.
3. Section 10270 - Access Flooring: Grounding systems for access flooring.
4. Section 13100 - Lightning Protection: Grounding of lightning protection system.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:
1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.
3. NFPA 70 - National Electrical Code.
4. NFPA 99 - Standard for Health Care Facilities.

1.3 SYSTEM DESCRIPTION

A. Grounding systems use the following elements as grounding electrodes:

1. Metal underground water pipe.
2. Metal building frame.
3. Concrete-encased electrode. (UFER)
4. Metal underground gas piping system.
5. Rod electrode.
6. Plate electrode.
7. Separately derive system.

1.4 DESIGN REQUIREMENTS

A. Construct and test grounding systems for access flooring systems on conductive floors accordance with IEEE 1100. Refer to Architectural sections.

1.5 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms maximum.

1.6 SUBMITTALS

A. Product Data: Submit data on grounding electrodes and connections.

B. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

C. Manufacturer's Installation Instructions:

1.7 CLOSEOUT SUBMITTALS

A. Submit test reports.

B. Project Record Documents: Record actual locations of components and grounding electrodes.

1.8 QUALITY ASSURANCE

A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.

B. Perform Work in accordance with State Municipality of local code standards

1.9 COORDINATION

A. Section 01300 - Administrative Requirements: Requirements for coordination.

B. Complete grounding and bonding of building reinforcing steel prior concrete placement.

PART 2 PRODUCTS

2.1 ROD ELECTRODES

A. Manufacturers:
1. Apache Grounding/Erico Inc.
2. Copperweld, Inc.
3. Erico, Inc.
4. O-Z Gedney Co.
5. Thomas & Betts, Electrical.

B. Product Description:
1. Material: Copper-clad steel.
2. Diameter: 3/4 inch.
3. Length:10 feet (3.0 m).

C. Connector: Connector for exothermic welded connection. Or grounding clamp.

2.2 ACTIVE ELECTRODES

2.3 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes: 2/0 AWG.

C. Grounding Electrode Conductor: Copper conductor.

D. Bonding Conductor: Copper conductor.

2.4 GROUNDING WELL COMPONENTS

A. Well Pipe: 8 inches x 24 inches long concrete pipe with belled end.

B. Well Cover: Fiberglass with legend "GROUND" embossed on cover.

2.5 MECHANICAL CONNECTORS

A. Manufacturers:
1. Apache Grounding/Erico Inc.
2. Copperweld, Inc. Model
3. Erico, Inc.
4. ILSCO Corporation.
5. O-Z Gedney Co.
6. Thomas & Betts, Electrical.

2.6 EXOTHERMIC CONNECTIONS

A. Manufacturers:
1. Apache Grounding/Erico Inc
2. Cadweld, Erico, Inc.
3. Copperweld, Inc.
4. ILSCO Corporation.
5. O-Z Gedney Co.
6. Thomas & Betts, Electrical.

B. Product Description: Provide exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify final backfill and compaction has been completed before driving rod electrodes.

3.2 PREPARATION

A. Remove paint, rust, mill oils, surface contaminants etc at connection points.

3.3 EXISTING WORK

A. Modify existing grounding system to maintain continuity to accommodate renovations.

B. Extend existing grounding system using materials and methods [compatible with existing electrical installations, or] as specified.

3.4 INSTALLATION

A. Install in accordance with IEEE 142, 1100.

B. Install rod electrodes at locations as indicated on Drawings. Install additional rod electrodes to achieve specified resistance to ground.

C. Install grounding and bonding conductors concealed from view.

D. Install grounding well pipe with cover at each rod location rod locations as indicated on Drawings. Install well pipe top flush with finished grade.

E. Install 2/0 AWG bare copper wire in foundation footing as indicated on Drawings Ufer Ground.

F. Install grounding electrode conductor and connect to reinforcing steel in foundation footing as indicated on Drawings. Electrically bond steel together.

G. Bond together metal siding not attached to grounded structure; bond to ground.

H. Bond together reinforcing steel and metal accessories in pool and fountain structures.

I. Install ground grid under access floors as indicated on Drawings. Construct grid of 12 AWG bare copper wire installed on 24 inch centers both ways. Bond each access floor pedestal to grid.

J. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Install 8 AWG bare copper bonding conductor.

K. Install isolated grounding conductor for circuits supplying electronic cash registers, personal computers and telephone equipment in accordance with IEEE 1100.

L. Install grounding and bonding in patient care areas to meet requirements of NFPA 99.

M. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

N. Connect to site grounding system. Refer to Section 02590.

O. Bond to lightning protection system. Refer to Section 13100 if installed.

P. Install continuous grounding using underground cold water system and building steel as grounding electrode. also, install artificial station ground by means of 2 driven rods or buried electrodes.

Q. Permanently ground entire light and power system in accordance with NEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.

R. Install branch circuits feeding isolated ground receptacles with separate insulated grounding conductor, connected only at isolated ground receptacle, ground terminals, and at ground bus of serving panel.

S. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.

T. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.

U. Permanently attach equipment and grounding conductors prior to energizing equipment.

V. Install Work in accordance with State and local Municipality standards.

3.5 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements 01700 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground resistance testing in accordance with IEEE 142.

E. Perform leakage current tests in accordance with NFPA 99.

F. Perform continuity testing in accordance with IEEE 142.

G. When improper grounding is found on receptacles, check receptacles in entire project and correct. Perform retest.

END OF SECTION

SECTION 16070

ELECTRICAL HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Conduit supports.
2. Formed steel channel.
3. Spring steel clips.
4. Sleeves.
5. Mechanical sleeve seals.
6. Firestopping relating to electrical work.
7. Firestopping accessories.
8. Equipment bases and supports.

B. Related Sections:
1. Section 03300 - Cast-In-Place Concrete: Product requirements for concrete for placement by this section.

1.2 REFERENCES

A. ASTM International:
1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

B. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.

C. Underwriters Laboratories Inc.:
1. UL 263 - Fire Tests of Building Construction and Materials.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
3. UL 1479 - Fire Tests of Through-Penetration Fire stops.
4. UL - Fire Resistance Directory.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 SYSTEM DESCRIPTION

A. Firestopping Materials: ASTM E119, ASTM E814, UL 263, UL 1479, to achieve fire ratings of adjacent construction in accordance with FM UL.

B. Surface Burning: ASTM E84, UL 723 with maximum flame spread / smoke developed rating of 25/450.

C. Firestop interruptions to fire rated assemblies, materials, and components.

1.5 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to applicable code FM UL for fire resistance ratings and surface burning characteristics.

B. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.6 SUBMITTALS

A. Section 01330 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.

C. Product Data:
1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
2. Firestopping: Submit data on product characteristics, performance and limitation criteria.

D. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.

E. Design Data: Indicate load carrying capacity of trapeze hangers hangers and supports.

F. Manufacturer's Installation Instructions:
1. Hangers and Supports: Submit special procedures and assembly of components.
2. Firestopping: Submit preparation and installation instructions.

G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with State and local Municipality standards.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five years experience.

B. Installer: Company specializing in performing work of this section with minimum five years experience.

1.9 PRE-INSTALLATION MEETINGS

A. Section 01300 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

PART 2 PRODUCTS

2.1 CONDUIT SUPPORTS

A. Manufacturers:
1. Allied Tube & Conduit Corp.
2. Erico-Caddy Manufacturing Company.
3. O-Z Gedney Co.
4. Substitutions: Per approval process

B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.

C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.

D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.

E. Conduit clamps - general purpose: One hole malleable iron for surface mounted conduits.

F. Cable Ties: High strength nylon temperature rated to 185 degrees F (85 degrees C). Self locking.

G. Do not support directly from the corrugated metal decking material. Install unistruct channels between the roof joist to support below the metal decking.

H. Do not run any conduits or cables with in 1-1/2” of the metal decking in accordance with NEC article 300.4 (E).

2.2 FORMED STEEL CHANNEL

A. Manufacturers:
1. Allied Tube & Conduit Corp.
2. B-Line Systems Model.
3. Midland Ross Corporation, Electrical Products Division.
4. Unistrut Corp.
5. Erico-Caddy.
6. Substitutions: Per approval requirements.

B. Product Description: Galvanized 12 gauge thick steel. With holes 1-1/2 inches on center.

2.3 SPRING STEEL CLIPS

A. Manufacturers:

1. Erico-Caddy

B. Per approval requirements.

2.4 SLEEVES

A. Furnish materials in accordance with State and local Municipality standards.

B. Sleeves for conduits Through Non-fire Rated Floors: 18 gage (1.2 mm) thick galvanized steel.

C. Sleeves for conduit Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

D. Fire-stopping Insulation: Glass fiber type, non-combustible.

2.5 MECHANICAL SLEEVE SEALS

A. Manufacturers:
1. Thunderline Link-Seal, Inc.
2. NMP Corporation.
3. Substitutions: As per approval requirements.

B. Furnish materials in accordance with State and local Municipality standards.

C. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.6 FIRESTOPPING

A. Manufacturers:
1. Dow Corning Corp.
2. International Protective Coating Corp.
3. 3M fire Protection Products.
4. Specified Technology, Inc.
5. Substitutions: Per approval.

B. Furnish materials in accordance with State and local Municipality standards.

C. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.

1. Silicone Firestopping Elastomeric Firestopping: Single or Multiple component silicone elastomeric compound and compatible silicone sealant.
2. Foam Firestopping Compounds: Multiple component foam compound.
3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.

5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

D. Color: [Dark gray] [Black] [As selected from manufacturer's full range of colors].

2.7 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by fire stopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent:
1. Mineral fiberboard.
2. Mineral fiber matting.
3. Sheet metal.
4. Plywood or particleboard.
5. Alumina silicate fireboard.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

D. General:
1. Furnish UL listed products [or products tested by independent testing laboratory].
2. Select products with rating not less than rating of wall or floor being penetrated.

E. Non-Rated Surfaces:
1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify openings are ready to receive sleeves.

C. Verify openings are ready to receive fire stopping.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of fire stopping material.

B. Remove incompatible materials affecting bond.

C. Install backing damming materials to arrest liquid material leakage.

D. Obtain permission from Architect/Engineer before using powder-actuated anchors.

E. Do not drill or cut structural members.

F. Obtain permission from Architect/Engineer before drilling or cutting structural members.

3.3 INSTALLATION - HANGERS AND SUPPORTS

A. Anchors and Fasteners:
1. Concrete Structural Elements: Provide precast inserts, expansion anchors, powder actuated anchors and preset inserts.
2. Steel Structural Elements: Provide beam clamps, spring steel clips, steel ramset fasteners, and welded fasteners.
3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts and hollow wall fasteners.
5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
6. Sheet Metal: Provide sheet metal screws.
7. Wood Elements: Provide wood screws.

B. Inserts:
1. Install inserts for placement in concrete forms.
2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

C. Install conduit and raceway support and spacing in accordance with NEC.

D. Do not fasten supports to pipes, metal decking, ceiling support wires, ducts, mechanical equipment, or conduit.

E. Install multiple conduit runs on common hangers.

F. Supports:
1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
2. Install surface mounted cabinets and panelboards with minimum of four anchors.
3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch (25 mm) off wall.
4. Support vertical conduit at every floor.

3.4 INSTALLATION - FIRESTOPPING

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring fire stopping.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.

D. Compress fibered material to maximum 40 percent of its uncompressed size.

E. Place intumescent coating in sufficient coats to achieve rating required.

F. Remove dam material after firestopping material has cured.

G. Fire Rated Surface:
1. Seal opening at floor, wall, partition, ceiling, and roof as follows:
   a. Install sleeve through opening and extending beyond minimum of 1 inch (25 mm) on both sides of building element.
   b. Size sleeve allowing minimum of 1 inch (25 mm) void between sleeve and building element.
   c. Pack void with backing material.
   d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
2. Where cable tray, bus, cable bus, conduit, wireway, or trough, penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.

H. Non-Rated Surfaces:
1. Seal opening through non-fire rated wall, partition floor, ceiling, and roof opening as follows:
   a. Install sleeve through opening and extending beyond minimum of 1 inch (25 mm) on both sides of building element.
   b. Size sleeve allowing minimum of 1 inch (25 mm) void between sleeve and building element.
   c. Install type of firestopping material recommended by manufacturer.
2. Install escutcheons floor plates or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.
4. Interior partitions: Seal pipe penetrations at clean rooms, laboratories, hospital spaces, computer rooms, telecommunication rooms or data rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.5 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 4” inches (100 mm) thick and extending 6 inches (150 mm) beyond supported equipment.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members formed steel channels. Brace and fasten with flanges bolted to structure.

3.6 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with adjustable interlocking rubber links.

B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.

C. Set sleeves in position in forms. Provide reinforcing around sleeves.

D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

E. Extend sleeves through floors 4 inches 100 mm above finished floor level. Caulk sleeves.

F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk [airtight]. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

3.7 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements 01700 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.8 CLEANING

A. Section 01700 - Execution Requirements: Requirements for cleaning.

B. Clean adjacent surfaces of firestopping materials.

3.9 PROTECTION OF FINISHED WORK

A. Section 01700 - Execution Requirements: Requirements for protecting finished Work.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 16075

ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Nameplates.
2. Labels.
3. Wire markers.
4. Conduit markers.
5. Stencils.
6. Underground Warning Tape.
7. Lockout Devices.

B. Related Sections:
1. Section 09900 - Paints and Coatings: Execution requirements for painting specified by this section.

1.2 SUBMITTALS

A. Product Data:
1. Submit manufacturer’s catalog literature for each product required.
2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with State, Municipality, Highways 0r Public Work's standards.

PART 2 PRODUCTS

2.1 NAMEPLATES:

A. Product Description: Laminated three-layer Black plastic engraved with White letters contrasting background color. Red plastic engraved with White letters contrasting background color for equipment on Emergency Power.

B. Letter Size:
1. 1/4 inch high letters for identifying individual electrical components.

2.2 WIRE MARKERS

A. Furnish materials in accordance with State standards.

B. Description: Cloth tape type wire markers.

C. Legend:
1. Power and Lighting Circuits: Branch circuit or feeder number as indicated on Drawings.
2. Control Circuits: Control wire number as indicated on schematic and interconnection shop drawings diagrams.

2.3 UNDERGROUND WARNING TAPE

A. Description: 4 inch wide plastic tape, detectable type, colored yellow with suitable warning legend describing buried electrical lines. At 12” below grade and at 12” above conduit or conduit groups.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09900 for stencil painting.

3.2 INSTALLATION

A. Install identifying devices after completion of painting.

B. Nameplate Installation:
1. Install nameplate parallel to equipment lines.
2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
4. Secure nameplate to equipment front using screws, rivets, or adhesive.
5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
6. Install nameplates for the following:
   a. Switchboards.
   b. Panelboards.
   c. Integrated Power Stations
   d. Transformers.
   e. Service Disconnects.
   f. Starters or contactors
   g. Relay Cabinets
   h. Equipment Cabinets
   i. Pull boxes

C. Label Installation:
1. Install label parallel to equipment lines.
2. Install label for identification of individual control device stations.
3. Install labels for permanent adhesion and seal with clear lacquer.

D. Wire Marker Installation:

1. Install wire marker for each conductor at switchboards, panelboards, pull boxes, outlet and junction boxes, and each load connection.
2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.

E. Underground Warning Tape Installation:
1. Install underground warning tape along length of each underground conduit, raceway, or cable 12 inches (150 to 200 mm) below finished grade and 12" above buried conduit, raceway, or cable.

END OF SECTION

SECTION 16123

BUILDING WIRE AND CABLE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes building wire and cable; nonmetallic-sheathed cable; direct burial cable; service entrance cable; armored cable; metal clad cable; and wiring connectors and connections.

1.2 REFERENCES

A. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SYSTEM DESCRIPTION

A. Product Requirements: Provide products as follows:
1. Solid conductor for feeders and branch circuits 10 AWG and smaller.
2. Stranded conductors for control circuits.
3. Conductor not smaller than 12 AWG for power and lighting circuits.
4. Conductor not smaller than 16 AWG for control circuits.
5. 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet
6. 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.

B. Wiring Methods: Provide the following wiring methods:
1. Concealed Dry Interior Locations: Use only building wire , Type THHN/THWN or XHHW insulation, in raceway.
2. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN XHHW insulation, in raceway.
3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN or XHHW insulation.
4. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN or XHHW in raceway.
5. Exterior Locations: Use only building wire, Type THHN/THWN or XHHW insulation, in raceway.
6. Underground Locations: Use only Type THHN/THWN or XHHW

1.4 SUBMITTALS

A. Section 16000 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit for building wire.

C. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors.

D. Test Reports: Indicate procedures and values obtained.

1.5 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of components and circuits.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum 10 years documented experience.

1.7 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on Drawings.

1.8 COORDINATION

A. Section 01300 - Administrative Requirements: Requirements for coordination.

B. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

C. Wire and cable routing indicated is approximate unless dimensioned. Include wire and cable lengths adequate for connection and expansion.

PART 2 PRODUCTS

‘2.1 BUILDING WIRE

A. Manufacturers:
1. Diamond Wire & Cable Co.
2. Essex Group Inc.
3. General Cable Co.
4. Substitutions: Pre approval.

B. Product Description: Single conductor insulated wire.

C. Conductor: Copper.

D. Insulation: 600 volt rating; thermoplastic material rated 75 degrees C.

E. Insulation: NFPA 70; Type THHN/THWN or XHHW insulation for feeders and branch circuits larger than 350 AWG]; Type TW, THHN/THWN insulation for feeders and branch circuits 250 AWG and smaller].

1.9 SERVICE ENTRANCE CABLE

A. Manufacturers:
1. Diamond Wire & Cable Co.
2. Essex Group Inc.
3. General Cable Co.
4. Substitutions: As per approval.

B. Conductor: Copper 600-Volt Rated.

C. Insulation: Type XHHW.

1.10 WIRING CONNECTORS

A. Solderless Pressure Connectors:
1. Burndy

B. Spring Wire Connectors:
1. Ideal
2. Burndy
3. 3M

C. Compression Connectors:
1. Burndy
2. Ideal

PART 2 EXECUTION

2.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify interior of building has been protected from weather.

C. Verify mechanical work likely to damage wire and cable has been completed.

D. Verify raceway installation is complete and supported.

2.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

2.3 INSTALLATION

A. Route wire and cable to meet Project conditions.

B. Neatly train and lace wiring inside boxes, equipment, and panelboards.

C. Identify [and color code] wire and cable under provisions of Section 16075. Identify each conductor with its circuit number or other designation indicated.

D. Special Techniques--Building Wire in Raceway:
1. Pull conductors into raceway at same time.
2. Install building wire 4 AWG and larger with pulling equipment.

E. Special Techniques - Cable:
1. Protect exposed cable from damage.

2. Support cables above accessible ceiling, using spring metal clips or [metal] [plastic] cable ties to support cables from structure [or ceiling suspension system]. Do not rest cable on ceiling panels.
3. Use suitable cable fittings and connectors.

F. Special Techniques - Wiring Connections:
1. Clean conductor surfaces before installing lugs and connectors.
2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
3. Tape un-insulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
4. Install split bolt connectors for copper conductor splices and taps, 6 AWG and larger.
5. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
6. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

G. Install solid conductor for feeders and branch circuits 10 AWG and smaller.

H. Install stranded conductors for branch circuits 10 AWG and smaller. However, when stranded conductors are used in lieu of solid, then install crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under screws.

2.4 WIRE COLOR

A. General
1. For wire sizes 10 AWG and smaller, install wire colors in accordance with the following:
   a. Black and red for single phase circuits at 120/240 volts.
   b. Black, red, and blue for circuits at 120/208 volts single or three phase.
   c. Orange, brown, and yellow for circuits at 277/480 volts single or three phase.
2. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:
   a. Black and red for single phase circuits at 120/240 volts.
   b. Black, red, and blue for circuits at 120/208 volts single or three phase.
   c. Orange, brown, and yellow for circuits at 277/480 volts single or three phase.

B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.

C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.

D. Feeder Circuit Conductors: Uniquely color code each phase.

E. Ground Conductors:
1. For 6 AWG and smaller: Green.
2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

2.5 FIELD QUALITY CONTROL

A. Quality Requirements: Testing and inspection services. Execution Requirements: Testing, adjusting, and balancing].

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

END OF SECTION

SECTION 16129

ELECTRIC HEAT - ROOF GUTTER MELT SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section includes furnish and install a complete UL Listed, CSA Certified, and FM Approved system of specified heating cable, components, and controls listed specifically for keeping roof eaves, gutters, and downspouts from being clogged by ice and snow.

B. Related Sections:

1. Section 16060 – Grounding and Bonding
2. Section 16070 – Electrical Hangers and Supports
3. Section 16123 - Building Wire and Cable.
4. Section 16130 - Raceway and Boxes.
5. Section 16442 - Panelboards

1.2 SUBMITTALS

A. Section 01330 & 16001 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit heating cable manufacturer's catalog information showing dimensions, configurations, controls and construction.

C. Manufacturer's installation instructions.

D. Manufacturer's testing parameters and instructions.

1.3 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Submittal procedures.

B. Project Record Documents: Record actual locations, lengths, and configurations of cable layouts.

1.4 COORDINATION

A Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for installation.

C. Determine connection locations and requirements.

D. Sequence installation to coordinate with installation of roof gutters and down spouts.

PART 2 PRODUCTS

2.1 HEATING CABLE

A. Manufacturers:

1. Raychem – Model GM-2XT.
2. Thermon – Model RGS.
3. Easyheat - Model SR52J.
4. Chromalox - Model SRF-RG.
5. Substitutions: Approved equals only.

C. Description: Self-regulating heating cable consisting of two (2) 16 AWG nickel-coated copper bus wires embedded in a self-regulating polymer core that varies its power output to respond to temperature along its length, allowing the cable to be crossed over itself without overheating, to be used with wood, plastic, and asphalt building materials and to be cut-to-length in the field.

D. Power: The heating cable shall operate on 120 volts AC.

E. Components: All heating cable components shall be UL Listed, CSA Certified, or FM Approved for use as part of the system to provide roof and gutter de-icing. Component enclosure shall meet NEMA 4X requirements to prevent water ingress and corrosion.

F. Power: Heating cable shall have a nominal power output of 12 watts per foot in snow and ice and 5 watts per foot in air, per IEEE 515-1997.

G. Construction: heating-cable outer jacket shall be an abrasion-resistant fluoropolymer. The cable shall have a minimum impact resistance of 10 ft-lb at 0 deg. C installation temperature per IEEE 515-1997, and a crush resistance of 2000 lb per UL1588-1993.

H. UV Stability: Cable and components shall be qualified for prolonged exposure to the sun per IEEE 515.1-1995, Section 4.3.2, and UL1588-1993.

I. Water Submersion: The cable and components shall be qualified to withstand continuous submersion in water for 2000 hours per IEEE 515.1-1995, Section 4.3.1.

2.1 CONTROLLER

B. Manufacturers:

1. Same as cable manufacturer listed in 2.1 A.

C. Description: Controller/sensor for snow and ice melting systems on roof eves and in gutters and downspouts. Compact unit to provide automatic on/off control and will initiate operation of heaters between 38 deg F and 0 deg F. Once started, operation continues even if the temperature drops below this limit during deicing.

D. Power: 120 VAC with contact ampere rating as required for the length of cable powered. Provide a 30-mA trip ground-fault circuit breaker to feed each cable run.

2.2 ACCESSORIES

A. Manufacturers:

1. Same as cable manufacturer listed in 2.1 A.

B. Provide all necessary accessories required for a complete installation including, but not limited to:

1. Downspout cable hangers designed to secure the cable when entering along downspouts to prevent abrasion of the cable by the edge of the gutter/downspout. Hanger is to be secured to the building fascia in a similar manner to the gutters.

2. Power Feed: Provide one power feed connection boot and one end cap for cable termination and connection to power source. The connection shall be watertight and sealed with RTV sealant. Power connection must be made in a NEMA 4, UL Listed junction box.

3. Aluminum tape: Secure the cable to the bottom of the gutter with 2” wide aluminum tape designed to hold cable in place and prevent movement during heavy rains. Allow one foot of tape for each foot of heating cable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify equipment is ready for electrical connection, for wiring, and to be energized.

3.2 INSTALLATION

A. Install cable lengths as indicated on the drawings and per the manufacturer’s specifications.

B. Install the heating cable in the bottom of the complete length of each gutter and down the complete length of each down spout, as indicated on the drawings, so that the cable comes out the end of the down spout as indicated on the drawings. Cable lengths shown on the plans including looping the cable down and back up inside the down spouts.

C. Install a single cable controller on each cable to energize the heating cable when the temperature drops below 32 deg. F.

D. Fasten the cable to the bottom of the entire length of each gutter with aluminum tape or adhesive as recommended by the manufacturer.

E. Secure the cables in the down spouts with down spout hangers designed for the cable.

3.3 ADJUSTING AND TESTING

A. Section 01700 - Execution Requirements: Testing, adjusting, and balancing.

B. Test every run of heat cable and confirm it operates properly including the controller/sensor. Replace any system component that does not function properly.

C. The heating cable shall be tested with at least a 500VDC megger. Do not use a megger with excess of 2500VDC or as required by the manufacturer.

1. Minimum acceptable readings shall be as specified by the manufacturer.

2. Provide a copy of the test results to the engineer and provide a copy in the Operation and Maintenance Manual.

3. Replace any cable that does not test out as specified by the manufacturer.

END OF SECTION

SECTION 16130

RACEWAY AND BOXES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.

B. Related Sections:

1. Section 02581 - Underground Ducts and Manholes.
2. Section 16132 - Indoor Service Poles.
3. Section 16133 - Cable Trays.
4. Section 16134 - Underfloor Raceway Assemblies.
5. Section 16141 - Floor Boxes.

1.2 REFERENCES

A. American National Standards Institute:
1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).

B. National Electrical Manufacturers Association:
1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

B. Underground outside Foundation Wall: Provide rigid steel conduit, intermediate or thickwall nonmetallic conduit. Provide cast metal boxes or nonmetallic boxes.

C. In or Under Slab on Grade: Provide rigid steel conduit, intermediate metal conduit, plastic coated conduit, thickwall nonmetallic conduit.

D. Outdoor Locations, Above Grade: Provide rigid steel and conduit.

E. In Slab Above Grade: Provide electrical metallic tubing or thickwall nonmetallic conduit.

1.4 DESIGN REQUIREMENTS

A. Minimum Raceway Size: 3/4 inch unless otherwise specified.

1.5 COORDINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Coordinate installation of outlet boxes for equipment connected under Section 16150.

C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

PART 2 PRODUCTS

2.1 METAL CONDUIT

A. Manufacturers:
1. Carlon Electrical Products.
2. Hubbell Wiring Devices.
3. Thomas & Betts Corp.
4. Walker Systems Inc.
5. The Wiremold Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. Rigid Aluminum Conduit: ANSI C80.5.

D. Intermediate Metal Conduit (IMC): Rigid steel.

E. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.2 FLEXIBLE METAL CONDUIT

A. Manufacturers:
1. Carlon Electrical Products.
2. Hubbell Wiring Devices.
3. Thomas & Betts Corp.
4. Walker Systems Inc.
5. The Wiremold Co.

2.3 WIREWAY

A. Manufacturers:
1. Carlon Electrical Products.

2. Hubbell Wiring Devices.
3. Thomas & Betts Corp.
4. Walker Systems Inc.
5. The Wiremold Co.

B. Product Description: General purpose Oiltight and dust-tight Raintight] type wireway.

C. Knockouts: Manufacturer's standard.

D. Size: 4 x 4 inch (100 x 100 mm) 6 x 6 inch (150 x 150 mm) 8 x 8 inch (200 x 200 mm) 12 x 12 inch (300 x 300 mm)]; length as indicated on Drawings.

E. Cover: Hinged cover.

F. Connector: Flanged.

G. Fittings: Lay-in type with removable top, bottom, and side; captive screws.

H. Finish: Rust inhibiting primer coating with gray enamel finish.

2.4 OUTLET BOXES

A. Manufacturers:
1. Carlon Electrical Products.
2. Hubbell Wiring Devices.
3. Thomas & Betts Corp.
4. Walker Systems Inc.
5. The Wiremold Co.

B. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch (13 mm) male fixture studs where required.
2. Concrete Ceiling Boxes: Concrete type.

C. Nonmetallic Outlet Boxes: NEMA OS 2.

D. Cast Boxes: NEMA FB 1, Type FD, cast feralloy. Furnish gasketed cover by box manufacturer. Furnish threaded hubs as required.

E. Wall Plates for Finished Areas: As specified in Section 16140.

F. Wall Plates for Unfinished Areas: Furnish gasketed cover.

2.5 PULL AND JUNCTION BOXES

A. Manufacturers:
1. Carlon Electrical Products.
2. Hubbell Wiring Devices.
3. Thomas & Betts Corp.
4. Walker Systems Inc.
5. The Wiremold Co.

B. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

C. Hinged Enclosures: As specified in Section 16131.

D. Surface Mounted Cast Metal Box: NEMA 250, Type 4, 4X or 6; flat-flanged, surface mounted junction box:
   1. Material: Galvanized cast iron.
   2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

E. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:
   1. Material: Galvanized cast iron.
   2. Cover:Nonskid cover with neoprene gasket and stainless steel cover screws.
   3. Cover Legend: "ELECTRIC".

F. Fiberglass Concrete composite Boxes: Die-molded, glass-fiber or concrete composite boxes:
   1. Cable Entrance: Pre-cut 6 inch x 6 inch (150 mm x 150 mm) cable entrance at center bottom of each side.
   2. Cover: Glass-fiber concrete composite, weatherproof cover with nonskid finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 INSTALLATION

A. Install Work in accordance with State or local Municipality standards.

B. Ground and bond raceway and boxes in accordance with Section 16060.

C. Fasten raceway and box supports to structure and finishes in accordance with Section 16070.

D. Identify raceway and boxes in accordance with Section 16075.

E. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.3 INSTALLATION - RACEWAY

A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.

B. Arrange raceway supports to prevent misalignment during wiring installation.

C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 16070 provide space on each for 25 percent additional raceways].

E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports

F. Do not attach raceway to ceiling support wires or other piping systems.

G. Construct wireway supports from steel channel specified in Section 16070.

H. Route exposed raceway parallel and perpendicular to walls.

I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.

J. Route conduit in and under slab from point-to-point.

K. Maximum Size Conduit in Slab Above Grade: 3/4 inch. Do not cross conduits in slab.

L. Maintain clearance between raceway and piping for maintenance purposes.

M. Maintain 12 inch (300 mm) clearance between raceway and surfaces with temperatures exceeding 104 degrees F (40 degrees C).

N. Cut conduit square using saw or pipe cutter; de-burr cut ends.

O. Bring conduit to shoulder of fittings; fasten securely.

P. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.

Q. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

R. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install [hydraulic one-shot bender to fabricate factory elbows for bends in metal conduit larger than 2 inch.

S. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.

T. Install fittings to accommodate expansion and deflection where raceway crosses seismic control and expansion joints.

U. Install suitable pull string or cord in each empty raceway except sleeves and nipples.

V. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

W. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.

X. Close ends and unused openings in wireway.

3.4 INSTALLATION - BOXES

A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings. Specified in section for outlet device.

B. Adjust box location up to 10 feet prior to rough-in to accommodate intended purpose.

C. Orient boxes to accommodate wiring devices oriented as specified in Section 16140.

D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

E. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire.

F. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

G. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches (150 mm) separation. Install with minimum 24 inches (600 mm) separation in acoustic rated walls.

H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

I. Install stamped steel bridges to fasten flush mounting outlet box between studs.

J. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

K. Install adjustable steel channel fasteners for hung ceiling outlet box.

L. Do not fasten boxes to ceiling support wires or other piping systems.

M. Support boxes independently of conduit.

N. Install gang box where more than one device is mounted together. Do not use sectional box.

O. Install gang box with plaster ring for single device outlets.

3.5 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with other Section.

B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation specified.

C. Locate outlet boxes to allow luminaires positioned as indicated on Drawings and reflected ceiling plan.

D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.6 ADJUSTING

A. Section 01700 - Execution Requirements: Testing, adjusting, and balancing.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused openings in boxes.

3.7 CLEANING

A. Section 01700 - Execution Requirements: Final cleaning.

B. Clean interior of boxes to remove dust, debris, and other material.

C. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 16140

WIRING DEVICES GENERAL

1.1 SUMMARY

A. Section includes wall switches; wall dimmers; receptacles; multioutlet assembly; and device plates and decorative box covers.

B. Related Sections:
1. Section 16134 - Underfloor Raceway Assemblies: Service fittings for receptacles installed in underfloor raceways.
2. Section 16130 - Raceway and Boxes: Outlet boxes for wiring devices.
3. Section 16141 - Floor Boxes: Service fittings for receptacles installed on floor boxes.
4. Section 16141 - Floor Boxes: Poke-through receptacles.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
1. NEMA WD 1 - General Requirements for Wiring Devices.
2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's catalog information showing dimensions, colors, configurations and ratings etc.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum 10 years experience.

1.5 EXTRA MATERIALS

A. Section 01700 - Execution Requirements: Spare parts and maintenance products.

B. Furnish 10 of each style, size, and finish wall plate.

PART 2 PRODUCTS

2.1 WALL SWITCHES

A. Manufacturers:
1. Hubbell
2. Pass Seymour
3. Leviton
4. Substitutions: Per approval.

B. Single Pole Switch:
   1. Hubbell Model HBL 1221
   2. Pass Seymour Model 20ACI.
   3. Leviton Model 1221.

C. Three-way Switch:
   1. Hubbell Model HBL 1223.
   2. Pass Seymour Model 20AC3.
   3. Leviton Model 1223

D. Four-way Switch:
   1. Hubbell Model HBL 1221 PL
   2. Pass Seymour Model 20AC-RDL
   3. Leviton Model 1221 PL

E. Color: White or as selected.

2.2 WALL SWITCHES

A. Product Description: NEMA WD 1, [Heavy-Duty] [General-Duty], AC only general-use snap switch.

B. Body and Handle: White – Thermal plastic or with toggle handle.

C. Indicator Light: Lighted handle type switch Separate pilot strap; red color.

D. Ratings:
   1. Voltage: 120 or volts, AC.
   2. Current: 20 amperes.

E. Ratings: Match branch circuit and load characteristics.

2.3 WALL DIMMERS

A. Manufacturers:
   1. Hunt
   2. Lutron

B. Product Description: NEMA WD 1; Semiconductor dimmer for incandescent lamps, Type as indicated on Drawings.

C. Body and Handle: White plastic with linear slide.

D. Voltage: 120 volts.

E. Power Rating: 600, 1000, 2000

F. Accessory Wall Switch: Match dimmer appearance.

2.4 RECEPTACLES

A. Duplex Convenience Receptacle:
   1. Hubbell Model HBL 5252
   2. Pass Seymour Model 5352
   3. Leviton Model 5362
   4. Substitutions: Per approval Requirements.

B. GFCI Receptacle:
   1. Hubbell Model HBL 5252G
   2. Pass Seymour Model 5352 GFI
   3. Leviton Model 5362 GFI
   4. Substitutions: Per approval Requirements.

C. Hospital Use Receptacle:
   1. Hubbell Model 8300 HS
   2. Pass Seymour Model 8300 X-SP
   3. Substitutions: Requirements Not Permitted.

2.5 RECEPTACLES

A. Manufacturers:
   1. Hubbell
   2. Pass Seymour
   3. Leviton

B. Product Description: NEMA WD 1, [Heavy-duty] [General-duty] general use receptacle.

C. Device Body: White nylon

D. Configuration: NEMA WD 6, type.

E. Convenience Receptacle: Type 5-20R.

F. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

2.6 WALL PLATES

A. Manufacturers:
   1. Hubbell
   2. Pass Seymour
   3. Leviton

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify outlet boxes are installed at proper height.

C. Verify wall openings are neatly cut and completely covered by wall plates.

D. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

A. Clean debris from outlet boxes.

3.3 INSTALLATION

A. Install devices plumb and level.

B. Install switches with OFF position down.

C. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

D. Do not share neutral conductor on load side of dimmers.

E. Install receptacles with grounding pole.

F. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.

G. Connect wiring devices by wrapping solid conductor around screw terminal. Install stranded conductor for branch circuits 10 AWG and smaller. When stranded conductors are used in lieu of solid, use crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under device screws.

H. Use jumbo size plates for outlets installed in masonry walls.

I. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 16130 to obtain mounting heights [as specified and] as indicated on drawings.

B. Install wall switch 48 inches 1.2 m above finished floor.

C. Install convenience receptacle 18 inches 450 mm above finished floor.

D. Install convenience receptacle 4 inches 100 mm above counter back splash of counter.

E. Install dimmer 48 inches 1.2 m above finished floor.

F. Coordinate installation of wiring devices with floor box service fittings provided under Section 16135.

3.5 FIELD QUALITY CONTROL

A. Quality Requirements: Testing and inspection services - Execution Requirements: Testing, adjusting, and balancing.

B. Inspect each wiring device for defects.

C. Operate each wall switch with circuit energized and verify proper operation.

D. Verify each receptacle device is energized.

E. Test each receptacle device for proper polarity.

F. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

A. Execution Requirements: Testing, adjusting, and balancing.

B. Adjust devices and wall plates to be flush and level.

3.7 CLEANING

A. Execution Requirements: Final cleaning.

B. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

SECTION 16210

ELECTRICAL UTILITY SERVICES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes arrangement with Utility Company for permanent electric service; payment of Utility Company charges for service; service provisions; and utility metering equipment.

B. Related Sections:
1. Section 03300 - Cast-In-Place Concrete: Concrete pads.

1.2 SYSTEM DESCRIPTION

A. Utility Company: Rocky Mountain Power

B. System Characteristics: 208Y/120 volts, three phase, four-wire, 60 Hertz.

C. Service Entrance: Underground

D. Underground Service Provisions: Underground service entrance to building service entrance equipment.
1. Utility Raceway Connection: At Utility Company's pad-mounted transformer.
2. Utility Service-Entrance Conductor Connection: At Utility Company's pad-mounted transformer. Service-entrance equipment and Metering equipment.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Submit Utility-Meter cabinets and bases.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Utility Company written requirements.

B. Maintain one copy of each document on site.

1.5 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on Drawings.

1.6 COORDINATION

A. Coordinate with utility company, relocation of overhead or underground lines interfering with construction. Where power lines are to be relocated, bill utility costs, directly to Owner.

B. Contact utility company regarding charges related to service installation. Include utility charges in this contract.

C. Utility charges for service installation will be paid by Owner and are not part of this contract.

PART 2 PRODUCTS

2.1 UTILITY METERS

A. Furnished by Utility Company.

B. Product Description: Meter base to be EUSERC compliance continuous duty with manual link bypass and in approved by local power company.

2.2 UTILITY METER BASE

A. Furnished by Electrical Contractor

B. Product Description: Product Description: Meter base to be EUSERC compliance continuous duty with manual link bypass and in approved by local power company.

2.3 TRANSFORMER PAD

A. Product Description: cast-in-place concrete transformer pad sized as indicated on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify service equipment is ready to be connected and energized.

3.2 EXISTING WORK

A. Remove exposed abandoned service entrance raceway and conductors[, including abandoned components above accessible ceiling finishes]. Cut raceway flush with walls and floors, and patch surfaces.

B. Disconnect abandoned service equipment and remove.

C. Maintain access to existing service equipment, boxes, metering equipment, and other installations remaining active and requiring access. Modify installation or provide access panel.

D. INSTALLATION

E. Install service entrance conduits to building service entrance equipment. Utility Company will connect service lateral conductors to service entrance conductors. Connect service lateral conductors to service entrance conductors.

F. Install cast-in-place concrete pad/vault for Utility Company transformer, in accordance with Rocky Mountain Power Company requirements..

END OF SECTION

SECTION 16261

STATIC UNINTERRUPTIBLE POWER SUPPLIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes static uninterruptible power supply.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:
1. IEEE 1184 - Guide for the Selection and Sizing of Batteries for Uninterruptible Power Systems.

B. National Electrical Manufacturers Association:
1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA PE 1 - Uninterruptible Power Systems.

C. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power. Distribution Equipment and Systems.

1.3 SUBMITTALS

A. Submittal procedures: Submit manufactures information on equipment noting all unit accessories and ratings.

B. Shop Drawings: Indicate electrical characteristics and connection requirements. Indicate battery rack dimensions; battery type, size, dimensions, and weight; detailed equipment outlines, weight, and dimensions; location of conduit entry and exit; single-line diagram indicating metering, control, and external wiring requirements; heat rejection and air flow requirements.

C. Product Data: Submit catalog sheets and technical data sheets to indicate physical data and electrical performance, electrical characteristics, and connection requirements.

D. Manufacturer's Field Reports: Indicate inspections, findings, and recommendations.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit description of operating procedures; servicing procedures; list of major components; recommended remedial and preventive maintenance procedures; and spare parts list.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [documented] experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect equipment from extreme temperature and humidity by storing in conditioned space.

B. Protect equipment from dust and debris by wrapping unit in dust tight cover and storing away from construction activity.

C. Deliver batteries no sooner than 21 days before charging.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Product Requirements.

B. Do not store or install unless temperature is maintained between 40 and 90 degrees F at relative humidity less than 80 percent non-condensing.

1.8 WARRANTY

A. Section 01700 - Execution Requirements: Product warranties and product bonds.

B. Furnish two year manufacturer warranty.

1.9 MAINTENANCE SERVICE

A. Section 01700 - Execution Requirements: Maintenance service.

B. Furnish service and maintenance of uninterruptible power supply for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 STATIC UNINTERRUPTIBLE POWER SUPPLY

A. Manufacturers:
1. Best Power Technology.
2. Liebert Corporation
3. APC American Power Conversion
4. Chloride Systems

B. Product Description: Dual redundant]uninterruptible power supply with reverse transfer.

C. System Ratings and Operating Characteristics:
1. System Continuous Rating: As indicated on Drawings,8 KVA, 10 KW, over entire battery voltage range at specified power factor. Maintain output voltage within specified limits at load from full load to no-load.

2. Battery Capacity: Capable of operating at full load for 15minutes.

3. Voltage Rating: 120/208] volts, 1 phase.
4. Input Voltage Operating Range: Plus or minus 10 percent.
5. Input Frequency Operating Range: 60 Hz. [plus or minus 5 Hz.
6. Input Current Limit: Adjustable to maximum of 125] percent required to operate at full load with battery bank on float charge.
7. Current Walk-in: 25 to 100 percent in fifteen seconds.
8. UPS Power Factor Over Full Range of Loads and Input Voltages: 80 to 100 percent, lagging.
9. Harmonic Distortion of Input Current Wave Form: 5 percent maximum at full load.
10. Output Voltage Regulation:
    a. Plus or minus 10 percent for balanced load, full range of DC input and no load to full load variations.
    b. Plus or minus 10 percent for 50 percent unbalanced load, full range of DC input and no load to full load variations.
    c. Plus or minus 10 percent during maximum overload of system.
11. Output Voltage Adjustment: Plus or minus 10 percent.
12. Output Harmonic Distortion: Maximum 5 percent rms total harmonic distortion (THD) and maximum 3 percent any single harmonic, at rated frequency and voltage, from 10 percent load to full load and over battery voltage range, measured into linear load.
13. Voltage Transient Response for Application of 0 to 50 Percent, 50 to 100 Percent, 100 to 50 Percent, and 50 to 0 Percent Step Loads, and Transfer To and From Bypass Line:
    a. Plus 8, minus 10 percent for maximum of 8.3 milliseconds.
    b. Plus or minus 5 percent for maximum of 25 milliseconds.
    c. Plus or minus 3 percent for maximum of 50 milliseconds.
    d. Recovery to steady state within 100 milliseconds after out-of-tolerance variation.
14. Phase Displacement:
    a. 120 plus or minus 1 degrees for balanced loads.
    b. 120 plus or minus 4 degrees for 50 percent unbalanced loads.
15. Output Current Limit: 130 percent of rated output current.
16. Voltage Unbalance: 5 percent maximum line-line with 100 percent load unbalance.

D. Design:

1. Designed for capacity expansion by addition of parallel modules in field with minimum downtime.
2. Rectifier/Charger Capacity: Sufficient to supply full load to inverter while recharging fully-discharged battery to 95 percent of full capacity in four hours or less; and within input current limits specified.
3. Furnish means for on-line testing of UPS, including test points to allow adjusting and servicing. Furnish means for testing static switch while load is bypassed to utility.
4. Mean Time Between Failures: 60,000 hours, minimum.
5. Cooling: Forced convection operation at full load and ambient temperature of 77 degrees F (25 degrees C) or lower.]
6. Operate battery floating, isolated from UPS AC input and AC output. Furnish battery resistance grounded through 5,000 - 10,000 ohms for purpose of ground fault sensing.

7. Do not use continuous moving parts or electron tubes. Accomplish power switching using semiconductor devices.
8. Construct equipment so each power component capable of replacement without soldering iron or special tools.
9. Use front-panel removable plug-in control modules.

E. Controls:
1. AC input circuit breaker.
2. "Inverter operate" switch to initiate inverter operation.
3. "Inverter standby" switch to cause inverter to cease operation
4. "Static switch transfer" switch to permit manual actuation of static transfer switch.
5. "Static switch lock-out" switch to inhibit automatic retransfer of load to inverter.
6. Battery charge timer.
7. "Indicator test" switch.
8. Static switch preferred input circuit breaker
9. Static switch output circuit breaker
10. Static switch bypass circuit breaker.

F. Indicators:
1. "Inverter synchronized to utility."
2. "Load connected to utility."
3. "Static transfer switch inhibited."
4. "High/low DC voltage."
5. "Over temperature."
6. "Inverter output overload."

G. Meters: Use 1] percent accuracy meters to indicate the following:
1. Rectifier/charger DC voltage and current.
2. Utility, inverter output, and load AC voltage.
3. Load AC current.
4. Inverter output and utility frequency.
5. UPS output watts.

H. Unit -mounted Alarm Panel: with the following monitoring and alarm functions:
1. "Utility power available."
2. "Utility bypass power available."
3. "Inverter output available."
4. "Inverter synchronized to utility."
5. "Load connected to inverter output."
6. "Load connected to utility bypass power (alarm)."
7. "Static transfer switch inhibited (alarm)."
8. "High/low DC voltage (alarm)."
9. "Over temperature (alarm)."
10. "Inverter output overload (alarm)."
11. Audible alarm (sounds when any of above alarm conditions occur).
12. Alarm/indicator "silence/test" switch.

I. Fabrication:
1. Electroplate brackets and securing hardware with corrosion resistant material. Secure bolts, studs and nuts with lock washers.
2. Identify internal wiring at each end of conductor. Furnish cabinet grounding lug.

3. Conversion Equipment Enclosure: NEMA 250, Type 1 enclosure allowing access from front for servicing adjustments and connections. Access through hinged door equipped with tumbler lock and latch handle. Equip cabinet for fork truck lifting.
4. Equip air inlet with permanent type filters and pressurize cabinet, or use gaskets around door and panel openings to prevent entry of dirt.
5. Cabinet finish: Primed and painted inside and outside with suitable semi-gloss enamel.

2.2 BATTERY

A. Storage Battery: Lead calcium heavy duty industrial battery, designed for auxiliary power service. Furnish battery with impact resistant plastic case. Furnish cells with explosion proof vents, clear containers, and ample space for plate growth without stressing container and cover.

B. Ampere-Hour Rating: Sized in accordance with IEEE 1184.

C. Battery Racks: Maximum of three tier, entirely steel construction, with plastic insulating rails at points of contact with battery case. Paint racks with acid resistant paint.

2.3 SOURCE QUALITY CONTROL

A. Furnish shop inspection and testing of components and completed UPS assembly.

B. Make completed UPS available for inspection at manufacturer's factory prior to packaging for shipment. Notify Owner Architect/Engineer at least seven days before inspection is allowed.

C. Allow witnessing of factory inspections and tests at manufacturer's test facility. Notify Owner Architect/Engineer at least seven days before inspections and tests are scheduled.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify HVAC Systems are operational to maintain specified environmental conditions.

3.2 EXISTING WORK

A. Disconnect and remove abandoned uninterruptible power supplies and accessories.

B. Clean and repair existing uninterruptible power supplies and accessories to remain or to be reinstalled.

3.3 FIELD QUALITY CONTROL

A. Section [01400 - Quality Requirements: Testing and inspection services] [01700 - Execution Requirements: Testing, adjusting, and balancing].

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.22.

D. Verify specification performance criteria.

E. Measure battery discharge and recharge times.

F. Simulate fault in each system component and utility power.

G. Operate unit at 77 degrees F (25 degrees C) for eight hours.

H. Perform other tests as recommended by manufacturer.

3.4 MANUFACTURER'S FIELD SERVICES

A. Section 01400 - Quality Requirements: Manufacturer's field services.

B. Prepare and start up UPS.

3.5 ADJUSTING

A. Execution Requirements: Testing, adjusting, and balancing.

B. Adjust output voltage to within 1 percent of nominal.

C. Adjust output frequency to within 1 percent of nominal.

3.6 DEMONSTRATION AND TRAINING

A. Furnish one hour of instruction each for [owners representative, to be conducted at project site with manufacturer's representative.

END OF SECTION

SECTION 16411

ENCLOSED SWITCHES

GENERAL

1.1 SUMMARY

A. Section includes fusible and non-fusible switches.

B. Related Sections:
1. Section 16491 - Fuses.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
1. NEMA FU 1 - Low Voltage Cartridge Fuses.
2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

B. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [documented] experience.

PART 2 PRODUCTS

2.1 FUSIBLE SWITCH ASSEMBLIES

A. Manufacturers:
1. Square D
2. General Electric
3. Cutler Hammer
4. Siemens
5. Substitutions: as per approval.

B. Product Description: NEMA KS 1, Type HD or GD with externally operable handle interlocked to prevent opening front cover with switch in ON position], enclosed load interrupter knife switch. Handle lockable in OFF position.

C. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.

D. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
1. Interior Dry Locations: Type 1.

2. Exterior Locations: Type 3R
3. Industrial Locations: Type 4.

E. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

F. Furnish switches with entirely copper current carrying parts.

2.2 NONFUSIBLE SWITCH ASSEMBLIES

A. Manufacturers:
1. Square D
2. General Electric
3. Cutler Hammer
4. Siemens
5. Substitutions: as per approval.

B. Product Description: NEMA KS 1, Type HD GD with externally operable handle interlocked to prevent opening front cover with switch in ON position] enclosed load interrupter knife switch. Handle lockable in OFF position.

C. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from [steel finished with manufacturer's standard gray.
1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R.
3. Industrial Locations: Type 4.

D. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

E. Furnish switches with entirely copper current carrying parts.

2.3 SWITCH RATINGS

A. Switch Rating: Horsepower rated for AC or DC as indicated on Drawings.

B. Short Circuit Current Rating: UL listed for [10,000 rms symmetrical amperes when used with or protected by Class H or K fuses (30-600 ampere)] [200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses (30-600 ampere switches employing appropriate fuse rejection schemes)]. [200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere)].

PART 3 EXECUTION

3.1 INSTALLATION

A. Install enclosed switches plumb. Provide supports in accordance with Section 16070.

B. Height: 5 feet (1500 mm) to operating handle.

C. Install fuses for fusible disconnect switches. Refer to Section 16491 for product requirements.

D. Install engraved plastic nameplates in accordance with Section 16075.

E. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.2 FIELD QUALITY CONTROL

A. Quality Requirements: Testing and Inspection Services - Execution Requirements: Testing, adjusting, and balancing.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.

END OF SECTION

SECTION 16421

ENCLOSED CONTROLLERS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes manual and magnetic motor controllers in individual enclosures.

B. Related Sections:
1. Section 16491 - Fuses.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
2. NEMA FU 1 - Low Voltage Cartridge Fuses.
3. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
4. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
5. NEMA ICS 6 - Industrial Control and Systems: Enclosures.
6. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

B. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

C. Test Reports: Indicate field test and inspection procedures and test results.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations and ratings of enclosed controllers.

B. Operation and Maintenance Data: Submit Replacement parts list for controllers.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [documented] experience.

PART 2 PRODUCTS

2.1 MANUAL MOTOR CONTROLLER

A. Manufacturers:
1. Siemens
2. General Electric
3. Square D
4. Cutler Hammer
5. Approved Equals

B. Product Description: NEMA ICS 2, AC general-purpose, Class A, manually operated, full-voltage controller with overload element, [red pilot light,] [[NO] [NC] auxiliary contact,] and [push button] [toggle] operator.

C. Enclosure: NEMA ICS 6, NEMA Type 1 or 3R to meet conditions of installation.

2.2 FRACTIONAL-HORSEPOWER MANUAL CONTROLLER

A. Manufacturers:
1. Siemens
2. General Electric
3. Square D
4. Cutler Hammer
5. Approved Equals

B. Product Description: NEMA ICS 2, AC general-purpose, Class A, manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light.

C. Enclosure: NEMA ICS 6, Type 1 or 3R to meet conditions of installation].

2.3 MOTOR STARTING SWITCH

A. Manufacturers:
1. Siemens
2. General Electric
3. Square D
4. Cutler Hammer
5. Approved Equals

B. Product Description: NEMA ICS 2, AC general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, without thermal overload unit, with [[red] [green] pilot light and] [key] [toggle] operator.

C. Enclosure: NEMA ICS 6, Type [1] [1B] [4] [to meet conditions of installation].

2.4 FULL-VOLTAGE NON-REVERSING CONTROLLERS

A. Manufacturers:
1. Siemens
2. General Electric

3. Square D
4. Cutler Hammer
5. Approved Equals

B. Product Description: NEMA ICS 2, AC general-purpose Class A [magnetic] [solid-state] controller for induction motors rated in horsepower.

C. Control Voltage: 120 volts, 60 Hertz.

D. Overload Relay: NEMA ICS 2; bimetal.

E. Product Features:
1. Auxiliary Contacts: NEMA ICS 2, (1) each normally open closed field convertible contacts in addition to seal-in contact.
2. Cover Mounted Pilot Devices: NEMA ICS 5, heavy-duty oiltight type.
3. Pilot Device Contacts: NEMA ICS 5, Form Z, rated.
4. Pushbuttons: Recessed or Shrouded type.
5. Indicating Lights: Transformer Resistor or LED type.
6. Selector Switches: Rotary type.
7. Relays: NEMA ICS 2.
8. Control Power Transformers: 120 volt secondary, in each motor starter. Or as indicated on Drawings. Furnish fused primary and secondary, and bond un-fused leg of secondary to enclosure.

F. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using thermal magnetic circuit breaker conforming to NEMA AB 1, with integral thermal and instantaneous magnetic trip in each pole.

G. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using motor circuit protector conforming to NEMA AB 1, with integral instantaneous magnetic trip in each pole. Obtain IEC Class 2 coordinated component protection.

H. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using non-fusible switch conforming to NEMA KS 1, enclosed knife switch with externally operable handle.

I. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using fusible switch conforming to NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate NEMA FU 1, Class R or J fuses. Obtain IEC Class 2 coordinated component protection.

J. Enclosure: NEMA ICS 6, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R.

2.5 TWO-SPEED CONTROLLERS

A. Manufacturers:
1. Siemens
2. General Electric
3. Square D
4. Cutler Hammer

5. Approved Equals

B. Product Description: NEMA ICS 2, AC general-purpose Class A [magnetic] [solid-state] controller for induction motors rated in horsepower. Include integral time delay transition between FAST and SLOW speeds.

C. Control Voltage: 120 volts, 60 Hertz.

D. Overload Relay: NEMA ICS 2; bimetal.

E. Product Features:
1. Auxiliary Contacts: NEMA ICS 2, (1) each normally open or closed field convertible contacts in addition to seal-in contact.
2. Cover Mounted Pilot Devices: NEMA ICS 5, duty oiltight type.
3. Pilot Device Contacts: NEMA ICS 5, Form Z, rated.
4. Pushbuttons: Unguarded Recessed or Shrouded type.
5. Indicating Lights: Transformer [Resistor or LED type.
6. Selector Switches: Rotary type.
7. Relays: NEMA ICS 2, .
8. Control Power Transformers: 120 volt secondary, in each motor starter or as indicated on Drawings. Furnish fused primary and secondary, and bond un-fused leg of secondary to enclosure.

F. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using thermal magnetic circuit breaker conforming to NEMA AB 1, with integral thermal and instantaneous magnetic trip in each pole.

G. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using motor circuit protector conforming to NEMA AB 1, with integral instantaneous magnetic trip in each pole. Obtain IEC Class 2 coordinated component protection.

H. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using non-fusible switch conforming to NEMA KS 1, enclosed knife switch with externally operable handle.

I. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using fusible switch conforming to NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate NEMA FU 1, Class [R] [J] fuses. Obtain IEC Class 2 coordinated component protection.

J. Enclosure: NEMA ICS 6, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type [3R] [4].

2.6 FULL-VOLTAGE REVERSING CONTROLLERS

A. Manufacturers:
1. Siemens
2. General Electric
3. Square D
4. Cutler Hammer

5. Approved Equals

B. Product Description: NEMA ICS 2, AC general-purpose Class A magnetic or solid-state controller for induction motors rated in horsepower. Include electrical interlock and integral time delay transition between FORWARD and REVERSE rotation.

C. Control Voltage: 120 volts, 60 Hertz.

D. Overload Relay: NEMA ICS 2; bimetal.

E. Product Features:
1. Auxiliary Contacts: NEMA ICS 2, (1) each normally open or closed field convertible contacts in addition to seal-in contact.
2. Cover Mounted Pilot Devices: NEMA ICS 5, heavy-duty oiltight type.
3. Pilot Device Contacts: NEMA ICS 5, Form Z, rated.
4. Pushbuttons: Recessed or Shrouded type.
5. Indicating Lights: Transformer Resistor or LED type.
6. Selector Switches: Rotary type.
7. Relays: NEMA ICS 2.
8. Control Power Transformers: 120 volt secondary, in each motor starter or as indicated on Drawings. Furnish fused primary and secondary, and bond un-fused leg of secondary to enclosure.

F. The following Controller Types as shown on the drawings.

G. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using thermal magnetic circuit breaker conforming to NEMA AB 1, with integral thermal and instantaneous magnetic trip in each pole.

H. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using motor circuit protector conforming to NEMA AB 1, with integral instantaneous magnetic trip in each pole. Obtain IEC Class 2 coordinated component protection.

I. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using non-fusible switch conforming to NEMA KS 1, enclosed knife switch with externally operable handle.

J. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using fusible switch conforming to NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate NEMA FU 1, Class R or J fuses. Obtain IEC Class 2 coordinated component protection.

K. Enclosure: NEMA ICS 6, to meet conditions. Fabricate enclosure from [steel finished with manufacturer's standard gray enamel.
1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R 4.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install enclosed controllers plumb. Provide supports in accordance with Section 16070.

B. Height: Maximum 6’-6” to operating handle.

C. Install fuses for fusible switches. Refer to Section 16491 for product requirements.

D. Select and install overload heater elements in motor controllers to match installed motor characteristics.

E. Install engraved plastic nameplates. Refer to Section 16075 for product requirements and location.

F. Neatly type label and place inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place label in clear plastic holder.

3.2 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.16.1.

END OF SECTION

SECTION 16442

PANELBOARDS

GENERAL

1.1 SUMMARY

A. Section includes distribution and branch circuit panelboards, electronic grade branch circuit panelboards, [and load centers].

B. Related Sections:
1. Section 16060 - Grounding and Bonding.
2. Section 16075 - Electrical Identification
3. Section 16491 - Fuses.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:
1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

B. National Electrical Manufacturers Association:
1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
2. NEMA FU 1 - Low Voltage Cartridge Fuses.
3. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
4. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
5. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
6. NEMA PB 1 - Panelboards.
7. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

C. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.

E. Underwriters Laboratories Inc.:
1. UL 67 - Safety for Panelboards.
2. UL 1283 - Electromagnetic Interference Filters.
3. UL 1449 - Transient Voltage Surge Suppressors.

1.3 SUBMITTALS

A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

B. Product Data: Submit catalog data showing specified features of standard products.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.

B. Operation and Maintenance Data: Submit spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [documented] experience.

PART 2 PRODUCTS

2.1 DISTRIBUTION PANELBOARDS

A. Manufacturers:
1. Siemens
2. Square D
3. General Electric
4. Cutler Hammer

B. Product Description: NEMA PB 1 panelboard.

C. Service Conditions:
1. Temperature: 105 degrees F.
2. Altitude: 4200 feet.

D. Panelboard Bus: Aluminum current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.

E. Minimum integrated short circuit rating: 10,000, 22,000, 65,000, 100,000, 200,000, amperes rms symmetrical for 240 or 208 volt panelboards; 14,000, 65,000, 100,000, 200,000 amperes rms symmetrical for 480 volt panelboards, or as indicated on Drawings.

F. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Furnish interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.

G. Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

H. Molded Case Circuit Breakers with Current Limiters: NEMA AB 1, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.

I. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.

J. Controllers: NEMA ICS 2, AC general-purpose Class A magnetic or solid-state controller for induction motors rated in horsepower.
1. Two-speed Controllers: Include integral time delay transition between FAST and SLOW speeds.
2. Full-voltage Reversing Controllers: Include electrical interlock [and integral time delay transition] between FORWARD and REVERSE rotation.
3. Control Voltage: 120 volts, 60 Hertz.
4. Overload Relay: NEMA ICS 2; bimetal.
5. Auxiliary Contacts: NEMA ICS 2, 2 one each normally open and closed contacts in addition to seal-in contact.
6. Cover Mounted Pilot Devices: NEMA ICS 5, standard duty type.
7. Pilot Device Contacts: NEMA ICS 5, Form Z.
8. Pushbuttons: Recessed.
9. Indicating Lights: LED type.
10. Selector Switches: Rotary type.
11. Relays: NEMA ICS 2.
12. Control Power Transformers: 120 volt secondary, 50 VA minimum, in each motor starter as indicated on Drawings. Furnish fused primary and secondary, and bond unfused leg of secondary to enclosure.

K. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated on Drawings.

L. Enclosure: NEMA PB 1, Type 1.

M. Cabinet Front: Surface type, fastened with concealed trim clamps hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

2.2 BRANCH CIRCUIT PANELBOARDS

A. Manufacturers:
1. Siemens
2. Square D
3. Cutler Hammer
4. General Electric

B. Product Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

C. Panelboard Bus: Aluminum, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard[; furnish insulated ground bus as indicated on Drawings.

D. For non-linear load applications subject to harmonics furnish 200 percent rated, plated copper, solid neutral.

E. Minimum Integrated Short Circuit Rating: 10,000, 22,000, 65,000 amperes rms symmetrical for 240 volt panelboards; 14,000, 65,000 amperes rms symmetrical for 480 volt panelboards or as indicated on Drawings.

F. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.

G. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.

H. Enclosure: NEMA PB 1, Type 1 or Type 3R.

I. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards, 6 inches deep, 20 inches wide for 480 volt panelboards.

J. Cabinet Front: Flush or Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finish in manufacturer's standard gray enamel.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1.

B. Install panelboards plumb.

C. Install recessed panelboards flush with wall finishes.

D. Height: 6 feet to top of panelboard install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

E. Install filler plates for unused spaces in panelboards.

F. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes to balance phase loads.

G. Install engraved plastic nameplates in accordance with Section 16075.

H. Install spare conduits out of each recessed panelboard to accessible location above ceiling. Minimum spare conduits: 5 empty 1 inch (DN27). Identify each as SPARE.

I. Ground and bond panelboard enclosure according to Section 16060. Connect equipment ground bars of panels in accordance with NFPA 70.

3.2 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.

C. Perform switch inspections and tests listed in NETA ATS, Section 7.5.

D. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1.

3.3 ADJUSTING

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 10% percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

SECTION 16510

INTERIOR LUMINAIRES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes interior luminaires, lamps, ballasts, and accessories.

B. Related Sections:
1. Section 16530 - Emergency lighting.

1.2 REFERENCES

A. American National Standards Institute:
1. ANSI C82.1 - American National Standard for Lamp Ballast-Line Frequency Fluorescent Lamp Ballast.
2. ANSI C82.4 - American National Standard for Ballasts-for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).

1.3 SUBMITTALS

A. Shop Drawings: Indicate dimensions and components for each luminaire not standard product of manufacturer.

B. Product Data: Submit dimensions, ratings, and performance data.

C. Samples: Submit two color chips 3 x 3 inch (75 x 75 mm) in size illustrating luminaire finish color where indicated in luminaire schedule or as required for fixture approval.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [documented] experience.

1.5 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.6 MAINTENANCE MATERIALS

A. Furnish two of each plastic lens type with 1 per 10 fixture installed.

B. Furnish 10% replacement lamps for each lamp installed.

C. Furnish 5 of each ballast type.

PART 2 PRODUCTS

2.1 INTERIOR LUMINAIRES

A. Product Description: Complete interior luminaire assemblies, with features, options, and accessories as scheduled.

2.2 FLUORESCENT BALLASTS

A. Manufacturers:
1. Cooper Industries Inc.
2. General Electric Co.
3. Hubbell Lighting.
4. Magnetek Inc.
5. Philips Electronic North America.

B. Product Description: Electronic ballast rapid start or instant start less than 20 percent THD High-power-factor type electromagnetic ballast certified by Certified Ballast Manufacturers, Inc. to comply with ANSI C82.1], suitable for lamps specified, with voltage to match luminaire voltage.

2.3 HIGH INTENSITY DISCHARGE (HID) BALLASTS

A. Manufacturers:
1. General Electric Co.
2. Philips Electronics North America
3. Radiant Lamp Co.
4. Siemens Corp.
5. Venture Lighting International Inc

B. Product Description: ANSI C82.4, metal halide high pressure sodium lamp ballast, suitable for lamp specified, with voltage to match luminaire voltage.

2.4 FLUORESCENT DIMMING BALLASTS AND CONTROLS

A. Manufacturers:
1. General Electric Co.
2. Hubbell Inc.
3. Thomas Industries
4. Lutron

B. Product Description: Electrical assembly of control unit and ballast to furnish smooth dimming of fluorescent lamps.

C. Control Unit: Linear slide type, rated 500, 1000, 1500, 2000 watts at 120 or 277 volts.

D. Ballast: Selected by dimming system manufacturer as suitable for operation with control unit and suitable for lamp type and quantity specified for luminaire.

2.5 INCANDESCENT LAMPS

A. Manufacturers:
   1. General Electric Co.
   2. Hanson Industries
   3. Philips Electronics North America

2.6 FLUORESCENT LAMPS

A. Manufacturers:
   1. General Electric Co.
   2. Philips Electronics
   3. Venture

2.7 HID LAMPS

A. Manufacturers:
   1. General Electric Co.
   2. Philips Electronic North America
   3. Venture
   4. Osram/Sylvania

PART 3 EXECUTION

3.1 INSTALLATION

A. Install suspended luminaires using pendants supported from swivel hangers. Install pendant length required to suspend luminaire at indicated height.

B. Support luminaires larger than 2 x 4 foot (600 x 1200 mm) size independent of ceiling framing with 4 GA wires.

C. Locate recessed ceiling luminaires as indicated on Drawings in coordination with reflected ceiling plan.

D. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.

E. Exposed Grid Ceilings: Support surface-mounted luminaires on grid ceiling directly from building structure Install auxiliary members spanning ceiling grid members to support surface mounted luminaires Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips.

F. Install recessed luminaires to permit removal from below.

G. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Install clips to secure recessed grid-supported luminaires in place.

I. Install wall-mounted luminaires at height as indicated on Drawings.

J. Install accessories furnished with each luminaire.

K. Connect luminaires to branch circuit outlets provided under Section 16130 using flexible conduit as indicated on Drawings.

L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

M. Install specified lamps in each luminaire per schedule.

N. Ground and bond interior luminaires in accordance with Section 16060.

3.2 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING

A. Aim and adjust luminaires [as indicated on Drawings].

3.4 CLEANING

A. Remove dirt and debris from enclosures.

B. Clean photometric control surfaces as recommended by manufacturer.

C. Clean finishes and touch up damage.

3.5 PROTECTION OF FINISHED WORK

A. Re-lamp luminaries having failed lamps at Substantial Completion.

END OF SECTION

SECTION 16520

EXTERIOR LUMINAIRES

GENERAL

1.1 SUMMARY

A. Section includes exterior luminaries, poles, and accessories.

1.2 REFERENCES

A. American National Standards Institute:
1. ANSI C82.1 - American National Standard for Lamp Ballast-Line Frequency Fluorescent Lamp Ballast.
2. ANSI C82.4 - American National Standard for Ballasts-for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).
3. ANSI O5.1 - Wood Poles, Specifications and Dimensions.

1.3 SUBMITTALS

A. Shop Drawings: Indicate dimensions and components for each luminaire not standard Product of manufacturer.

B. Product Data: Submit dimensions, ratings, and performance data.

C. Samples: Submit two color chips 3 x 3 inch (75 x 75 mm) in size illustrating luminaire finish color where indicated in luminaire schedule.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [documented] experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store and handle solid wood poles in accordance with ANSI O5.1.

1.6 COORDINATION

A. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

B. Include anchor bolts, nuts and covers for all poles.

PART 2 PRODUCTS

2.1 LUMINARIES

A. Product Description: Complete exterior luminaire assemblies, with features, options, and accessories as scheduled.

2.2 FLUORESCENT AND BALLASTS

A. Manufacturers:
1. General Electric Co.
2. Magnetek Inc.
3. Philips Electronic North America Model.

B. Product Description: [High-power-factor type electromagnetic ballast certified by Certified Ballast Manufacturers, Inc. to comply with ANSI C82.1], suitable for lamps and environmental conditions specified, with voltage to match luminaire voltage.

2.3 LAMPS

A. Manufacturers:
1. General Electric Co.
2. Philips Electronics North America.
3. Venture

2.4 METAL POLES

A. Manufacturers:
1. As per lighting fixture schedule

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify foundations are ready to receive fixtures.

3.2 INSTALLATION

A. Install concrete bases for lighting poles at locations as indicated on Drawings.

B. Install poles plumb double nuts to adjust plumb. Grout around each base.

C. Install lamps in each luminaire.

D. Bond and ground luminaries ,metal accessories and metal poles.

3.3 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for improper connections and operation.

B. Measure illumination levels [to verify conformance with performance requirements].

C. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

3.4 ADJUSTING

A. Aim and adjust luminaries to provide illumination levels and distribution [as indicated on Drawings].

3.5 CLEANING

A. Clean photometric control surfaces as recommended by manufacturer.

B. Clean finishes and touch up damage.

3.6 PROTECTION OF FINISHED WORK

A. Relamp luminaries having failed lamps at Substantial Completion.
1.

END OF SECTION

SECTION 16740

TELEPHONE/DATA SYSTEM

PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes:
1. Conduit supports.
2. Formed steel channel.
3. Spring steel clips.
4. Sleeves.
5. Mechanical sleeve seals.
6. Firestopping relating to electrical work.
7. Firestopping accessories.

1.2 RELATED SECTIONS AND DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and ALL other sections of Division 16

B. Equipment requiring rough-ins and/or connections by Division 16 may be shown on the architectural drawings and/or specified in Sections 1 through 15 Division 16 is responsible for these rough-ins and/or connections whether shown on the electrical drawings or not.

1.3 DESCRIPTION OF WORK:

A. The extent of telephone system work is indicated by drawings and is hereby defined to include, but not be limited to raceway, outlets, device plates, backboards, grounding and miscellaneous items required for complete raceway system and cables.

B. Refer to other Division-16 sections for requirements for raceways, trays, boxes and fittings, wiring devices (plates), and supporting devices, and other sections, as applicable.

1.4 QUALITY ASSURANCE:

A. Comply with applicable portions of NEC as to type products used and installation of components. Provide products and materials, which have been UL-listed and labeled.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Provide complete raceway system for telephone including but not limited to, raceway, outlets, device plates, backboards, grounding and miscellaneous items as required.

B. Provide 4" square box with appropriate plaster or tile ring.

C. Provide telephone cover plates for wall outlets to match color and material of wiring device plates; for floor outlets, match color and material of floor power outlet covers.

D. Provide fire treated, or hypalon coated plywood terminal backboards, 4' x 8' x ¾" unless noted otherwise. Mount the terminal board with 8' dimension horizontally on the wall.

E. Provide terminal cabinets of code gauge steel, flush or surface, as indicated, with concealed trim clamp, concealed hinges and flush lock, with gray baked enamel finish to match finish of panel board covers. Construct back boxes of code gauge galvanized steel with removable end walls.

PART 3 - EXECUTION

3.1 INSTALLATION OF TELEPHONE SYSTEM RACEWAY:

A. Install raceway system as indicated to comply with NEC and recognized industry practices. Install a minimum of one ¾" conduit from each telephone, data or combination telephone/data outlet to telephone/data terminal backboard, tray, or terminal cabinet unless otherwise noted on the drawings. **Provide nylon pull cord in all empty raceway.**

B. Provide a 12" x 24" x 24" ground mounted junction box at the property line for connection of the building service entrance conduit. Box to meet State of Utah ITS standards.

C. GROUNDING: Provide one #6 copper ground conductor from the Main Distribution Frame (MDF) and each Intermediate Distribution Frame (IDF) telephone terminal board to the service entrance ground. Enclose in suitable raceway for entire length. Provide a copper ground terminal buss at each telephone board with minimum of (6) Six terminal lugs to receive minimum of #10 ground conductor. Make connection at service entrance ground. See drawings for additional requirements.

D. POWER: Provide minimum of one duplex power receptacle on a dedicated circuits adjacent to each terminal backboard or cabinet. Provide additional outlets and circuits as shown or detailed on the drawings.

END OF SECTION

SECTION 16835

CLOSED CIRCUIT TELEVISION AND DIGITAL RECORDING SYSTEM

PART 1 GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. Refer to General Conditions, Supplemental General Conditions, Special Conditions, and Division 1 General Requirements and all other Divisions and Sections related to the security requirements, conditions, equipment and provisions.

B. Specific manufacturer name(s) and model number(s) are used to establish a level of quality and a specific set of operational functions.

1.2 DESCRIPTION OF WORK:

A. Provide and install a completed complete and operating 100% solid-state, color video system complete with cameras, monitors, protective enclosures, lenses, mounting hardware, cables, switching equipment and other such products, equipment and wiring normally and reasonably required for the operation of a complete video surveillance and digital recording system.

B. Equipment shall conform to the requirements of FCC and EIA rules and regulations including EIA standard RS-170A covering color television equipment.

C. These systems include interfacing and interconnection with other low voltage systems described in this specification. Verify the requirements for these interfaces and provide auxiliary equipment necessary for complete functioning of all systems.

D. Provision of conduit, raceways, shelves and backboards is not included under this section of the work but the security subcontractor shall closely coordinate installation of these.

1.3 APPROVED INSTALLERS:
Wasatch Control Systems Salt Lake City, Utah

1.3 **PROJECT REQUIREMENTS**:

A. A representative from Alcoholic Beverage Control (ABC) Mr. Bill Garner, Inventory Auditor, Telephone # 801-977-6840 will coordinate and meet with the contractor at the store location before installation of the surveillance equipment, to discuss the mounting and viewing angles of the camera of complete operating system as per specifications. Coordination is critical wit ABC and State ITS department on the project. Contractor to contact the Department of Alcoholic Beverage Control to coordinate the proper system installation.

B. Digital Video Recorder will need to be delivered to the Department of Alcoholic Beverage Control for software installation and programming prior to installation.

1.4 SUBMITTALS:

A. PRODUCT DATA: Submit manufacturer's data on closed circuit TV and recording systems including, but not limited to, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals. Also include standard or typical riser and complete wiring diagrams for controls and system components.

B. SHOP DRAWINGS: Provide shop drawings showing equipment/device locations and connecting wiring of entire CCTV system. Include wiring diagrams and riser diagrams.

Provide to the owner the following:

1. A complete set of shop drawings indicating: locations of all cameras, power supplies and controllers; point-to-point wiring diagrams for all devices.
2. Wiring diagrams for: cameras, environmental enclosures, mounts ; controllers; auxiliary devices.
3. A complete equipment list identifying: type; model; manufacturer; manufacturer data sheets.
4. A complete list identifying: cameras; remote signaling and auxiliary functions zones or control points; specific devices associated with each zone or control zone.

Failure to submit the above information shall result in immediate rejection of the shop drawings and product data.

PART 2 - PRODUCTS

2.1 EQUIPMENT:

A. All CCTV equipment shall be as manufactured by one of the following, contingent upon meeting the plans and specifications.
Philips
Pelco
Toshiba
Sony

B. INTERIOR EXTERIOR PRE-PACKAGED FIXED CAMERA/LENS/DOME HOUSING ASSEMBLY:

Pelco #DF5-PG-E1
Sony #CNB-D2310NVD /D2310PVD
Approved Equal

1. The camera/lens/housing shall include a fixed 1/3 inch 24Vac CCD color high-resolution camera 520 TV lines
2. The camera/lens/housing shall be an indoor ceiling or pendent mount or outdoor, wall-mounted dome with 3 point axis viewing and vandal resistant.
3. The outdoor camera/lens/housing shall include an integrated heater and sunshield for environmental protection.
4. The camera/lens assembly shall be pre-wired to a connector on the top of the housing.
5. The package shall include an integral auto iris lens with manual focus and zoom adjustments.
6. The auto iris lens shall have an 3.5 to 8 mm vari-focal model.

7. The housing shall allow for 360° viewing adjustm ent.
8. Provide mounting hardware for pendant mounting of camera enclosure at +12'-0" AFF.

C. ENVIRONMENTAL SPECIFICATIONS

Temperature: At external temperatures of -40 °C to +50 °C (-40 °F to +122 °F), maintains internal temperatures between -20 °C and +50 °C (-4 °F to 122 °F).Salt atmosphere: MIL-STD-8819E, method 509, procedure 1.Enclosure protection: IP 65, designed to meet NEMA 4.

For surface mounted exterior pre-packaged fixed camera/lens/dome housing assemblies provide units which meet the requirements listed above for wall mounted units. Provide units with a smoked high abuse dome.

D. CCTV EQUIPMENT CONSOLE

Equipment Rack to house equipment

E. DIGITAL VIDEO RECORDING SYSTEM

Toshiba DVR16-480-2000 16 camera, 2 Terabyte fixed disk w/current Surveillix software

16 Input Digital Video Recording System

The digital video management system design shall be a microprocessor-based video processor, multiplexer and recorder running on the Windows 2000 operating system. Designed to operate with black-and-white and color composite video signals, the device shall compress and multiplex video images from up to 16 cameras and store them in the unit's image database. It shall provide a variety of multiple- and single-camera display options, optional operator-selected activity target settings, playback, optional image enhancement tools and several alarm/event triggered response options. The unit shall provide operator-definable live filters to record and trigger alarm events when the light level change, motion is detected or a perimeter is crossed. The unit shall provide operator-definable filters to search the image database for light changes, motion and perimeter violations, as well as camera, date/time and filter settings, then display a list of matching video segments. It shall provide for simultaneous recording, playback, transmitting, database searching and archiving. One channel of audio and up to four text inputs shall be supported with required hardware properly installed and set up according to manufacturer's instructions. Live audio shall be available for listening while viewing live video. Recorded audio shall be available for listening while viewing recorded video from any camera recorded during the same time frame. The unit shall be capable of displaying up to 16 cameras during playback mode with or without text. Text shall be available during playback without obstruction of the video image. All display features shall be available from an on-screen interface. Some features shall also be available from an optional manufacturer-specific camera control device. All programming features shall be available from an on-screen programming interface. The unit shall provide for network operation with a manufacturer-specific software application.

Camera selection for display shall be controlled from the main screen. It can also be controlled from an optional manufacturer-specific camera control device.

Sequential switching of each camera in full screen or in the lower right quadrant shall be controlled through on-screen programming. It can also be controlled from an optional manufacturer-specific camera control device.

A call/spot monitor option shall permit an additional video monitor either to display a single camera's live video signal or to automatically display video in sequence from alarmed cameras.

In playback mode, video output shall be available as a signal in single-camera format at 640x480 pixels, in four-camera format at 320x240 pixels per pane, in nine-camera format at 213x160

pixels per pane or in 16-camera format at 160x120 pixels per pane. When full-screen display is selected, the signal in single-camera format shall be resized to 800x600, in four-camera format to 400x300 per pane, in nine-camera format to 267x200 per pane or in 16-camera format to 200x150 per pane. The unit shall allow operator selection and display of stop-action or frozen images of any stored image while in playback mode. As an option, the unit shall allow magnification of a display image up to a factor of 16 times its original size.

Playback tools shall provide the means to enhance any stored image for display or output to an attached printer. This selection of tools shall include image enhancement, image sharpening, brightness and contrast control, and hue and saturation/lightness control.

In playback mode, the unit shall allow a selected image to be saved to an internal floppy disk drive or loaded from a floppy disk and displayed on the unit. The unit shall allow the use of enhancement tools on the loaded image.

Images stored in the database shall be identified to allow search and retrieval by type of event or image. Searches shall be specified by alarm, camera number, date/time, event type (i.e., video loss) or filter. Search results shall be provided in a scrollable list to allow selection for display.

The digital video management system shall be approximately 17.5″ D x 17″ W x 6.75″ H. A single unit shall fit into a standard 19″ rack.

Front panel power and reset switches shall have a tactile response (click) and a minimum operating life of 100,000 cycles when operating at a maximum rate of two cycles per second. The buttons shall be accessible through pinholes on the front panel.

F. MONITOR
The monitor shall be capable of operating from 120 VAC, 60 Hz.

G. FLAT SCREEN MONITORS
Office Desk 17”flat screen LCD Monitor finish to be black.

Overhead or wall mounted (4 Required) 21” LCD Monitor black finish

The monitor shall be capable of operating from 120 VAC, 60 Hz.

User controls shall include:
Power, Brightness, Contrast, Auto Adjust, Vertical and Horizontal Position Image Adjust, Color Control

Monitors to be provided complete with mounting hardware for wall, ceiling or pendant mounting.

H. CAMERA POWER SUPPLY;
16 Channel 5A 120volt /24VAC or 28VAC selectable output per channel with circuit breaker protection
Altronics AV 248 or equal

I. RACK MOUNT KITS

J. VIDEO CABLING:
Video cables used in overall signal path lengths (camera to furthest monitor) of 250 feet or less shall be of the coaxial type and have a copper braided shield with 95% minimum coverage with a 22 gauge stranded copper center conductor with a nominal impedance of 75 ohms. The cable shall have a cellular polyethylene (foam) insulation and black polyethylene jacket. DC resistance of center conductor shall be no greater than 15 ohms per 1000 foot length. Cable shall be West Penn #816.

Video cables used in overall signal path lengths (camera to furthest monitor) of more than 250 feet shall be of the coaxial type and have a copper braided shield with 95% minimum coverage with a 14 gauge solid copper center conductor with a nominal impedance of 75 ohms. The cable shall have polyethylene insulation and black polyethylene jacket. DC resistance of center conductor shall be no greater than 2.6 ohms per 1000 foot length. Not more than 25 feet (composite) of the video cable specified above may be used in these longer runs to facilitate termination and connection of the video system. Cable shall be West Penn #811.

Connectors for use throughout the video Surveillance system for video signals shall be 'BNC' type and where possible all equipment shall be provided with matching connectors. Signal cable connectors shall be provided as required to match the equipment.

K. ADDITIONAL CCTV EQUIPMENT: See CCTV Riser. Contractor shall supply and install all applied accessories required to provide a complete video surveillance system.

PART 3 EXECUTION

3.1 INSTALLATION:

A. Security video camera and monitor interconnections shall be made as shown on the drawings.

B. Coaxial video and signal cable shall be installed in metallic conduits and shall be continuous from outlet to outlet without splices. Termination of cables shall be at equipment locations only. Install coaxial cable without sharp bends and terminate only with connectors.

C. When running coaxial cable a 10-12ft. service loop is required both at the camera and head end equipment.

D. Special care in cable installation shall be exercised to avoid grounds due to careless terminations or damage to the jacket over the shield. Take special care to ensure that random contact of shields of adjacent cables do not occur in consoles and at junction boxes.

E. Exterior units shall be mounted for optimum coverage and shall protect camera from accidental blows and vandalism. Provide all required mounting hardware.

F. Locate each camera only after completing the above described procedure with the Owner. Provide all hardware and fully install all surveillance system equipment.

Perform the following start-up tasks:

1. Aim all Cameras
2. Program all camera identifiers as directed by the Owner.
3. Make such other settings and adjustments as required to bring the system on-line and operating in accordance with these specifications.

H. Coordinate non-video connections to the weatherproof camera enclosures, switchers, monitors, and other equipment specified for use in this section. These connections include grounding and coordination for installation of 120 VAC power.

I. Camera identification shall be provided for all cameras. Identifications are to be provided by owner.

J. Program the switchers, quad splitters, DVR’s, etc. for operation as requested by the owner.

K. Coordinate with the custom cabinet supplier to assure proper installation dimensions, ventilation and mounting requirements. Custom panels with monitors installed shall not deflect more than 1/8 inch. Additional support for the panel shall be installed to limit the deflection if required.

3.2 TRAINING:

A. The Contractor shall include in the base contract all costs required to train the Owner operating and maintenance personnel in the use and maintenance of systems provided under this division of the specifications. Instructors certified in writing, by the manufacturer of the specific system, shall conduct the training sessions. Provide a minimum of 4 hours or training to be divided into two training sessions. Training sessions are to be recorded. The videotapes or disks are to be turned over to the owner with the O&M Manuals.

3.3 WARRANTY:

A. Provide a one year parts and on site labor warranty. This does not include abuse, mishandling or acts of nature.

END OF SECTION 16835

SECTION 16900

FIRE ALARM DETECTION SYSTEM

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.

B. Division-16 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Install a new addressable fire alarm detection system

B. Comply with NEC as applicable to construction and installation of fire alarm and detection system components and accessories. Provide components and systems, which are UL-listed and labeled for fire alarm. Provide fire alarm and detection systems and accessories, which are FM approved. Comply with State and local requirements as applicable.

C. Comply with applicable provisions of current NFPA Standards for 72A Local Protective Signaling Systems, 72B Auxiliary Protective Signaling Systems, 72C Remote Station Protective Signaling Systems (as applicable), local building codes, and meet requirements of local authorities having jurisdiction.

1.3 SUBMITTALS:

A. PRODUCT DATA: Submit manufacturer's data on fire alarm and detection systems including, but not limited to, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals. Also include standard or typical riser and complete wiring diagrams for panel and system.

B. SHOP DRAWINGS: Provide shop drawings showing equipment/device locations and connecting wiring of entire fire alarm and detection system. Include wiring diagrams and riser diagrams of panel.

C. CERTIFICATION: Submit a written statement to the Architect and the state and local Fire Marshal's Office that each device of the fire alarm system has been installed, inspected and tested in accordance with applicable requirements of NFPA Standard 72. This statement shall be submitted at the time of completion of the fire alarm system installation.

D. Provide to the design engineer and the Local Fire Marshall's office the following:

1. A complete set of shop drawings indicating:

   a. Location of all alarm-initiating and alarm-signaling devices.
   b. Point-to-point wiring diagrams for all alarm-initiating and alarm-signaling devices.

2. Wiring diagrams for:
   a. Fire Security Alarm control panel.
   b. Auxiliary function relays and solenoids.
   c. Remote signaling equipment.

3. Standby battery calculations.

4. A complete equipment list identifying:
   a. Type
   b. Model
   c. Manufacturer
   d. Manufacturer catalog data sheets
   e. UL Listing and/or FM approval showing compatibility of device with Fire Alarm Control Panel (FACP)

5. A complete zone list identifying all:
   a. Alarm-initiating and alarm-signaling devices.
   b. Remote signaling and auxiliary function zones.
   c. Specific devices associated with each zone.

6. A complete Certificate of Compliance

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Fire Alarm Detection System:
Silent Knight

2.2 FIRE ALARM DETECTION SYSTEM SECURITY SYSTEMS:

A. GENERAL: Provide an electrically operated, electrically supervised fire alarm/security system as described herein. Include control units, power supplies, alarm initiating and indicating devices, arming panel, door contacts, glass break sensors, motion sensors, conduit, wire, fittings and accessories required to provide a complete operating system. Enclose entire system in raceway. Provide basic wiring materials which comply with Division 16, Basic Materials and Methods Sections for raceways, conductors, boxes, fittings, supports, etc.

B. SYSTEM TYPE: Analog addressable, non-coded. Either manual activation of a fire alarm station or activation of an automatic initiating device energizes all fire alarm signaling devices, sounding a non-coded alarm and providing device identification on an annunciator panel.

C. SYSTEM OPERATION: Provide system such that any manual station or automatic initiating device annunciates all alarm indicating units (bells, horns, buzzers, chimes, visual alarm lamps, etc.) continuously until the manual station or initiating device is restored to normal and the fire alarm control unit reset. Annunciate alarm signals by zone at the control panel and all remote annunciators. Provide all conductors, raceway, equipment and labor to accomplish the following:

1. Deactivate air supply and return fan units simultaneously by means of a supervised master fan shutdown relay with slave relays as required. Restart air units automatically after panel has been reset. Provide a bypass switch for master fan shut down relay for drill purposes, and indicate by a locked-in lamp that the circuit has been bypassed.
2. Selectively activate and/or deactivate fan units in accordance with schedule shown on the drawings.
3. Release all magnetic door holders upon activation of an alarm from any zone by use of a master relay in the control panel.
4. Provide supervised circuits for the following:
5. System shall report to Central Station as determined by facility owner. Install one conductor pair from the fire alarm panel to the telephone terminal board. Make all connections at both the fire alarm panel and the telephone terminal board. Make arrangements at the appropriate stage of

construction to arrange for the leased line. This request must be made at least two weeks prior to final connection.

6. Provide fire alarm security control panel with capability of shutting down individual initiating devices for maintenance purposes without affecting the continued operation of other initiating devices.
7. The general system shall not activate elevator recall, only the local device. Recall initiating detectors shall have auxiliary contacts. Appropriate wiring in conduit shall be run from the initiating devices to the elevator control panel. These devices shall also initiate an evacuation alarm.
8. Sprinkler Supervision. Provide a signal initiating and supervisory circuit to each sprinkler riser and subdivision. Provide continuous alarm signal upon actuation of any water flow signal initiating device. Sound alarm until the condition has been corrected and panel manually reset as required by UL 864. Provide separate alarm zones for: (1) alarm zones from "waterflow alarms", (2) alarm zones from "supervisory alarm" indicating sprinkler system trouble. Provide power to all sprinkler system alarm bells furnished under Section 15.
9. Monitor all doors as shown on drawings.
10. Provide motion and glass breakage sensors as shown on the drawings
11. Provide system arming station as shown on the drawings.
12. Provide dialer compatible to central station monitoring

2.3 PERIPHERAL DEVICES:

A. MANUAL FIRE ALARM STATION :

Provide red enclosure, manual fire alarm stations with the following features:

1. Poly Carbonate construction, for semi-flush mounting.
2. Addressable alarm type electrically compatible with system requirements.
3. Double Action
4. Break glass design requiring unit to be opened for resetting, and requiring resetting before closing.
5. Electrically compatible with system requirements.
6. Key reset, keyed like fire control panel. Provide one spare "glass" for each station required.

B. IONIZATION SMOKE DETECTORS:

All ionization smoke detectors shall be capable of being replaced without disconnecting any wires or wire connectors from the base of the detector. Each detector shall be installed on a separate base. The detector base shall be capable of receiving a photoelectric, ionization, or electronic thermal detector. All ionization fire detectors shall be UL 268 listed. All detectors shall have (2) viewable LEDs to indicate the status of the device.

<u>DUCT FIRE DETECTORS WITH SAMPLING TUBE)</u>:

Provide ionization type with UL 268A listings. Each detector shall be equipped with a remote light located as on the drawings. Each detector shall have (2) form "c" alarm contacts rated at 10 amps.

<u>AUDIOVISUAL ALARM HORNS SEMI-FLUSH MOUNTED OR EQUAL)</u>:

A. Provide audio-visual alarm horns with the following features:

1. Die cast or stamped steel construction, finished in red enamel, suitable for indoor or outdoor application.

2. Capable of 90 db sound level at 10 feet.

3. Flush mounted.

4. Integrally mounted flashing light unit, with Lexan lens with block letters "FIRE", and minimum flash rate of ONE per second, and 75 candela minimum.

5. Electrically compatible with system requirements.

6. Horns shall sound the temporal pattern (code 3) until silenced.

7. Audiovisual alarm horns shall have the ability to silence horns while maintaining the strobe flash, until reset.

8. Mechanical horn mechanism only, electronic horns are not acceptable.

9. Maximum 24 horns per circuit, maximum 8 strobes per circuit.

B AUXILIARY RELAY:

Remote auxiliary relay boards shall be rated at 10 AMPS @ 120 VAC. A red LED shall light to indicate relay activation. All relays shall transfer on general alarm and latch on until reset. All relays shall be supervised. The control output provided can be used in conjunction with fire alarm applications (i.e. fan controls, dampers, doors, and any other general alarm control).

C. ZONE MODULES:
Provide style "6" zone modules capable of receiving and annunciating an alarm from any detector, even with a single fault condition on any on any initiating circuit.

D. Power all smoke detectors from the "Style 6" initiating loop wiring. For systems which power smoke detectors separately from the "Style 6" loop, provide monitoring for both the power source and the independent zone wiring, so that complete trouble and alarm indication is achieved by zone. Provide capability to operate all smoke detectors, even with a single fault condition on the smoke detector power wiring. Provide the number of zones shown on the fire alarm zone schedule (see drawings).

E. SIGNALING MODULES:

Provide signaling as required. Provide power adequate to sound all signaling devices concurrently. Provide supervised indicating circuits for polarized 24V D.C. alarm signaling devices. Provide 30% spare capacity.

Each signal circuit shall have a separate disconnect switch for servicing the fire alarm system. Each and every indicating circuit shall have a distinct location description. Power supply shall be at fire alarm control panel. Remote power supplies and indicating circuits will not be acceptable.

G. SYSTEM CONFIGURATION PROGRAMMING:

To help the owner in programming, system changes, and servicing, the fire alarm system shall have the ollowing functions.

1) The FACP shall be capable of an auto-configuration, which via a password, all analog devices and panel modules are automatically programmed into the system. At this point the

system will operate as a general alarm system without any other programming.

2) If any two devices are addressed the same, the LED's on both devices will light steady and the panel will read "extra address and the address number".

3) If any device is installed and not programmed into the system the LED will light steady and the panel will read the same as above.

H. BATTERIES:

Provide Gel Cell standby batteries capable of operating fire alarm system for minimum of 24 hours, then perating all indicating units for at least five minutes. Locate batteries in fire alarm control unit, or in similar type enclosure located as directed. Provide all interconnecting wiring. Place batteries which vent hydrogen gas in separate enclosure.

I. Provide wall mounted Security System arming station, door position indicator switches and door monitors, motion and glass break sensors.

PART 3 – WIRING

3.1 GENERAL REQUIREMENTS:

A. All new wire used on the fire alarm system shall be U.L. Listed as fire alarm protective signaling circuit cable per NEC, Article 760. Bell wire or thermostat wire is not acceptable.

B. If twisted or shielded wire is required or recommended by the manufacturer it must be used.

PART 4 - FINAL ACCEPTANCE AND GUARANTEE

4.1 GUARANTEE:

A. Furnish a three-year guarantee for all equipment, materials and installation, including all labor, transportation, and equipment.

B. Emergency Response. The fire alarm equipment supplier shall provide an emergency response within four hours of any reported system failure to resolve the problem on a continuous basis.

4.2 FINAL TEST:

A. Before the installation shall be considered completed and acceptable, a test on the system shall be performed as follows:

1. The contractor's job foreman, a representative of the manufacturer, a representative of the district, and the fire department shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel.

2. The supervisory circuitry of the initiating and indicating circuits shall also be verified.

3. Provide the following spare devices:
3 smoke detectors with base
2 strobe/horns
2 manual pull stations with addressable modules

PART 5 - AS BUILT DRAWINGS AND OPERATION AND MAINTENANCE MANUALS:

5.1 LABELING:

A. All devices shall be labeled with their appropriate address. The labels shall be 36 point Kroy labels.

B. All initiating devices shall be programmed to include the device address and a complete user text English location description. i.e. Device L4S76, Smoke Detector, 1st floor Rm.17

5.2 AS BUILT DRAWINGS:

A. A complete set of CAD "as-built" drawings showing installed wiring, color coding, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of the system.

B. A building map shall be supplied to the owner indicating the exact location of all devices along with the addresses of the individual devices. Install building fire alarm map adjacent to the fire alarm panel. Provide high quality plastic sign (map holder) with two layers. The back layer shall be painted black. The front layer shall be a clear center for viewing the CAD fire alarm drawing. Edges of the sign shall be colored to match the building interior. The building map shall indicate the various by the use of different colors (minimum of five colors).

C. The disk containing the files shall be supplied to the owner. These disks shall include all information required to allow the Owner to change the fire alarm program them selves. These computer disks shall contain a minimum of the following:

1. CAD drawing files of building fire alarm map
2. CAD drawing files of as-built fire alarm/security components and point to point connections.
3. General configuration programming.
4. Job specific configuration programming.
5. Tutorial file on complete programming of fire alarm system.

5.3 OPERATING AND MAINTENANCE MANUALS:

A. Operating and maintenance manuals shall be submitted prior to testing of the system. A total of (4) manuals shall be delivered to the Owner. Manuals shall include all service, installation, and programming information.

5.4 TRAINING:

Provide Two (2) hours training on the operation and installation of fire alarm system, at job site, at no cost to owner.

END OF SECTION 16900

DEPARTMENT OF ALCOHOLIC BEVERAGE CONTROL
NEW LIQUOR STORE

SECTION 16910 – BUILDING SECURITY SYSTEM

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.

B. Division-16 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Install a new building security system addressable fire alarm detection system security system

B. Comply with NEC as applicable to construction and installation of the building security system components and accessories. Provide components and systems, which are UL-listed and labeled for security systems. Comply with State and local requirements as applicable.

1.3 SUBMITTALS:

A. PRODUCT DATA: Submit manufacturer's data on the building security system including, but not limited to, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals. Also include standard or typical riser and complete wiring diagrams for panel and system.

B. SHOP DRAWINGS: Provide shop drawings showing equipment/device locations and connecting wiring of entire fire alarm and detection system. Include wiring diagrams and riser diagrams of panel.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Building Security System
Ademco Vista 32FB

2.2 BUILDING SECURITY SYSTEM:

A. GENERAL: Provide an electrically operated, electrically supervised security system as described herein. Include control units, power supplies, alarm initiating devices, arming panel, door contacts, glass break sensors, motion sensors, conduit, wire, fittings and accessories required to provide a complete operating system. Enclose entire system in raceway. Provide basic wiring materials which comply with Division 16, Basic Materials and Methods Sections for raceways, conductors, boxes, fittings, supports, etc.

B. SYSTEM OPERATION: Provide system such that any automatic initiating device annunciates all alarm indicating units (bells, horns, buzzers, chimes, visual alarm lamps, etc.) continuously until the initiating device is restored to normal and the security alarm control unit reset. Annunciate alarm signals by individual device location at the control panel. Provide all conductors, raceway, equipment and labor to accomplish the following:

1. Monitor all doors as shown on drawings.
2. Provide motion and glass breakage sensors as shown on the drawings
3. Provide system arming station as shown on the drawings.
4. Provide dialer compatible to central station monitoring

2.3 SCOPE OF THE WORK:

1. Install complete building security system.
2. Install all system alarm devices as show on prints.
3. All initiating devices connected to the security control panel shall be supervised.
4. All wiring shall be in conduit. All conduit and connectors shall be made of steel.
5. Provide Gel Cell standby batteries capable of operating the security system for minimum of 24 hours, then operating all indicating units for at least five minutes. Locate batteries in control panel.
6. Provide wall mounted Security System arming station, door position indicator switches and door monitors, motion and glass break sensors.

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS:

A. Install and wire all security devices as shown on the drawings and indicated on the project submittals

3.2 FINAL TEST:

A. Before the installation shall be considered completed and acceptable, a test on the system shall be performed as follows:

1. Operate every building security device to ensure proper operation and correct annunciation at the control panel.

2. All supervisory circuitry of the initiating and indicating circuits shall also be verified.

3.3 AS BUILT DRAWINGS:

A. A building map shall be supplied to the owner indicating the exact location of all devices along with the addresses of the individual devices. Install building fire alarm map adjacent to the fire alarm panel. Provide high quality plastic sign (map holder) with two layers. The back layer shall be painted black. The front layer shall be a clear center for viewing the CAD fire alarm drawing. Edges of the sign shall be colored to match the building interior. The building map shall indicate the various by the use of different colors (minimum of five colors).

3.4 OPERATING AND MAINTENANCE MANUALS:

A. Operating and maintenance manuals shall be submitted prior to testing of the system. A total of (3) manuals shall be delivered to the Owner. Manuals shall include all service, installation, and programming information.

5.4 TRAINING:

Provide Two (2) hours training on the operation and installation of building security system at job site, at no cost to owner.

END OF SECTION 16910