



State of Utah

JON M. HUNTSMAN, JR.
Governor

GARY R. HERBERT
Lieutenant Governor

Department of Administrative Services

KIMBERLY HOOD
Executive Director

Division of Facilities Construction and Management

DAVID G. BUXTON
Director

MEMORANDUM

Date: 20 July 2007

To: Prospective Bidders

From: Dave McKay, Development Project Manager, DFCM

Reference: DLD/DMV Joint Facility
DFCM Project No. 07037550

Subject: **Addendum No. 2**

This page serves as the cover/transmittal sheet for attachments itemized below.

Note: This Addendum shall be included as part of the Contract Documents. Items in this Addendum apply to all documents whether referenced or not involving the portion of the work added, deleted, modified, or otherwise addressed in the Addendum.

SCHEDULE HAS NOT CHANGED

2.1 The following instructions are special requirements for this project and will be considered included in the stage two bids

Special Requirements

The following instructions are special requirements for this project and will be considered included in the stage two bids:

Definitions

The term “responsibility,” used in the instructions that follow, includes architectural and engineering design, cost, schedule and construction responsibility for completion of this project in accordance with the documents of this Program and RFP for DFCM project no. 07037550, Driver License Division & Department of Motor Vehicles Joint Facility - Draper, Utah. It is the responsibility of the Design Build bidder to provide a complete and fully functioning facility. Omissions in this RFP and Technical Requirements do not relieve the bidder from providing a complete and fully functioning facility.

The term “bidder and design build team” refers to the successful design build team including the General Contractor, the design team, and all associated consultants and subcontractors.

The term “the work” refers to the design and construction of the Driver License Division & Department of Motor Vehicles Joint Facility, including all utility hook ups, coordination with DFCM for voice, data, multimedia systems, fire protection, security systems, other special systems and all Furniture, Fixtures and Equipment.

Minimum Standards and Conflicts: The RFP and associated program and technical requirements are considered minimum standards. Conflicts between these instructions, DFCM standards and within the RFP shall be brought to the attention of DFCM during Stage II. In general, when there is a conflict the most stringent requirement will be followed. DFCM must approve all products that vary from the stated Standards and requirements of this RFP.

Geotechnical Report and Survey

DFCM has provided a Geotechnical Report and Survey as part of this proposal information. This Geotechnical Report is provided as general information only and is not a warrant of subsurface conditions. It is the bidders responsibility to verify all geotechnical conditions prior to construction commencing. The bidder is responsible to pay for the services of a Geotechnical Engineer licensed in the State of Utah to coordinate and verify subsurface conditions that are to be addressed and resolved by new construction. It is the bidder’s responsibility to also verify the survey.

Testing, Inspection and Commissioning

DFCM will provide testing, inspection and commissioning. The design build team will coordinate with DFCM for start ups, testing, inspection and all commissioning activities.

FF&E

DFCM will be responsible for FF&E procurement, installation and design. The bidder will be responsible for coordination of power, installation and any special design and construction requirements to make the FF&E functional within the facility.

Temporary Construction Power, Data and Telecom for Construction

The bidder will be responsible for hook up to these systems and for the cost of these services.

Demolition

It is the bidders responsibility to perform all demolition required to accomplish the work. The bidder is responsible for fugitive dust control, site erosion control and the coordination with DFCM and Draper City regarding removal of debris from the site.

Schedules

Time is of the essence and the bidder must provide a critical path method (CPM) schedule at the beginning of the project to be approved by DFCM. This CPM schedule will be prepared by a professional scheduler and will be the measured schedule for the project. Once this initial CPM schedule is established and approved it will be updated monthly with each pay application. The initial CPM schedule cannot be modified except to indicate progress and recovery processes when the CPM schedule is not met. The bidder will also prepare a 3 week look-a-head and critical path only schedule for each job site meeting. A current 3 week look-a-head schedule and the updated CPM schedule must be submitted with each pay application in order for payment approval. The CPM schedule must also identify submittal deadlines and all long lead items required for the project. Bidders who propose an accelerated schedule must keep their proposed finish date for the project. All time between the accelerated finish date the finish date of this RFP will be considered as owners time for move-in.

Weekly Project Meetings

The bidder will conduct a weekly job site meeting to discuss and coordinate issues with DFCM and the Design Team. The bidder will provide and distribute meeting notes for each meeting. The architect of record's project manager must be in attendance to all job site meetings. Engineers and subcontractors are not required to attend these meeting unless it is necessary to coordinate special issues related to the owner.

Exterior Elements

Exterior elements such as grills, exhaust and venting elements, utility access points and meters, loading docks, dumpsters, transformers, and all other utilitarian support elements for this facility must be integrated into the design solution and controlled visually to enhance the facility exterior. The roof of this facility is an architectural design element. Roof top mechanical penthouses and other mechanical and building systems will be allowed on the roof but must be part of the architectural design. These elements will not be left to chance scale, color, form, placement and location. Exterior finishes and materials will be durable finishes as per the performance specification of this RFP.

Telephone and Computer Cabling

The bidder will coordinate with DFCM to provide a complete and operative telephone and computer connectivity system for the facility. The bidder is responsible for: power, cooling, conduit, cabling, Cable trays, and mounting substructures. DFCM is responsible for purchase and installation of the related operation systems including outlets.

Security and other speciality Systems

The bidder will coordinate with DFCM to provide a complete and operative systems for the facility. The bidder is responsible for: power, cabling, mounting substructures and outlets. Related operation systems will be provided and installed by DFCM.

Carpet

Bidders will be responsible for purchase and installation of carpet, please refer to technical requirements.

Exclusions and Conflicts

The Bidder will provide a comprehensive list of all exclusions or exceptions from the requirements of this RFP document. This list is required even if exclusion items are indicated in the documents. If conflicts are observed in the RFP documents or if the scope of work is not clearly defined, it is the responsibility of the bidder to notify DFCM of the conflict/clarity issue and request clarification in writing prior to bidding. Without clarification, the more stringent requirements will govern.

Questions and Clarification

All questions will be submitted in writing to DFCM - Dave McKay. All clarification will be issued as Addenda.

Utilities and Impact Connections, Permits and Fees

It is the responsibility of the bidder to coordinate all Utility hook ups with the appropriate entities including Draper City. It is the bidder's responsibility to determine and coordinate schedule and cost of all impact and permit fees required for this project. Water flow tests and the resolution of required water pressure are the responsibility of the bidder.

Hazardous Material

Removal and control of existing hazardous materials will be the responsibility of the State of Utah.

1% for Arts Allowance

Bidders will provide an allowance to be determined by DFCM to accommodate an art piece or pieces for this project. Bidders will coordinate with selection and installation of this piece. The State of Utah will pay for the actual art piece. This allowance is for possible power requirements, footings or special architectural considerations and will include all costs associated to provide space for the art piece(s).

Specifications

Bidders will be responsible to develop and submit full construction specifications for this project.

DLD/DMV Standards

Please note that there are several products that are referred to by brand name by DFCM. These products are required to meet existing DLD/DMV standards. Please see Appendix A for Sole Source Instructions.

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END OF SECTION 000110

SECTION 011000 - SUMMARY

1.1 SUMMARY

- A. Work Covered by the Contract Documents:
 - 1. Project Identification: Department of Motor Vehicles + Driver License Division. DFCM Project No. 07037550.
 - a. Project Location: Draper, Utah.
 - 2. Owner: Division of Facilities Construction and Management (DFCM).
 - 3. DFCM Project Coordinator: David McKay.
 - 4. The Work consists of a new single-story building and associated sitework.
- B. Contract: Single design/build contract.
- C. Work Phases: No phases required by Owner.
- D. Work Under Other Contracts:
 - 1. Preceding Work: None.
 - 2. Concurrent Work:
 - a. Telecom and data systems, queue-system, pneumatic tube system. Raceways and pathways for above systems provided by contractor.
 - b. Freestanding exterior sign (location by Owner). Power to sign including interior switch provided by contractor.
 - 3. Future Work: Furnishings.
- E. Products Ordered in Advance: None.
- F. Owner-Furnished Contractor-Installed Products:
 - 1. None.
- G. Use of Premises: Full use.
- H. Owner's Occupancy Requirements: Partial.
 - 1. Owner occupancy of completed areas of construction.

END OF SECTION 011000

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

1.1 SUMMARY

- A. Minor Changes in the Work: AIA Document G710, "Architect's Supplemental Instructions", issued by Architect.
- B. Proposal Requests: Owner's form.
- C. Change Orders: Owner's form issued after Owner's approval.
- D. Construction Change Directives: Owner's form issued by Architect.

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

1.1 SUMMARY

A. Schedule of Values:

1. Format: Line items based on Project Manual table of contents, coordinated with Contractor's Construction Schedule. Owner's form.

B. Applications for Payment:

1. Payment Application Times: Indicated in the Agreement.
2. Payment Application Forms: Owner's form.
3. Special requirements for Initial Application for Payment, Application for Payment at Substantial Completion, and Final Payment Application.

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

1.1 SUMMARY

- A. Coordination Drawings.
- B. Administrative and supervisory personnel.
- C. Project meetings.
- D. Requests for Information (RFIs). Owner's form.

1.2 PROJECT MEETINGS

- A. Preconstruction conference.
- B. Preinstallation Conferences: Before each construction activity that requires coordination with other construction.
- C. Progress Meetings: At weekly intervals, coordinated with preparation of payment requests.
- D. Coordination Meetings: As required, in addition to specific meetings held for other purposes.

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

1.1 SUMMARY

- A. Contractor's Construction Schedule.
- B. Daily construction reports.
- C. Material location reports.
- D. Field condition reports.
- E. Special reports.

1.2 QUALITY ASSURANCE

- A. Scheduling Specialist: Experienced in CPM scheduling and reporting.

1.3 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Comply with Owner requirements.
- B. Schedule Type: CPM.

1.4 REPORTS

- A. Material Location Reports: At monthly intervals, a comprehensive list of materials delivered to and stored at Project site.
- B. Field Condition Reports: On discovery of a difference between field conditions and the Contract Documents, submitted with a request for information.
- C. Special Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work.

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

1.1 SUMMARY

- A. Preconstruction and periodic construction photographs.

1.2 PRODUCTS

- A. Photographic Media: Digital images, in uncompressed TIFF format.
- B. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties and buildings, including existing items to remain during construction, from different vantage points.
- C. Periodic Construction Photographs: Weekly.

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

1.1 SUMMARY

- A. Action Submittals: Information that requires Architect's responsive action.
- B. Informational Submittals: Information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.2 PROCEDURES

A. Action Submittals:

1. Action Submittals:

- a. Product Data.
- b. Shop Drawings.
- c. Samples.
- d. Product schedule or list.
- e. Contractor's Construction Schedule.
- f. Submittals Schedule.
- g. Application for Payment.
- h. Schedule of Values.
- i. Subcontract list per RFP (initial list)

B. Informational Submittals:

1. Informational Submittals:

- a. Coordination Drawings.
- b. Contractor's Construction Schedule.
- c. Qualification data.
- d. Welding certificates.
- e. Installer certificates.
- f. Manufacturer certificates.
- g. Product certificates.
- h. Material certificates.
- i. Material test reports.
- j. Product test reports.
- k. Research/evaluation reports.
- l. Schedule of tests and inspections.
- m. Preconstruction test reports.
- n. Compatibility test reports.
- o. Field test reports.
- p. Maintenance data.
- q. Design data.
- r. Manufacturer's instructions.

- s. Manufacturer's field reports.
 - t. Insurance certificates and bonds per DFCM requirements.
 - u. Construction photographs.
 - v. Material Safety Data Sheets.
- C. Delegated-design submittals.
- D. Contractor's Review:
- 1. Submittals: Marked with approval stamp before submitting to Architect.
- E. Architect's Action:
- 1. Action Submittals: Stamped with an action stamp and returned.
 - 2. Informational Submittals: Reviewed but not returned, or rejected if it does not comply with requirements.
 - 3. Submittals Not Required: May not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

1.1 SUMMARY

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements.

1.2 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer.
 - 2. Manufacturer.
 - 3. Fabricator.
 - 4. Professional engineer.
 - 5. Specialists.
 - 6. Testing agency.
 - 7. Factory-authorized service representative.
- B. Preconstruction testing.
- C. Mockups: For each form of construction and finish required, using materials indicated for the completed Work. Mockups establish the standard by which the Work will be judged.
 - 1. Disposition: May become part of the Work.

1.3 QUALITY CONTROL

- A. Owner Responsibilities: Owner will engage a qualified testing agency to perform quality-control services indicated as Owner's responsibility.
- B. Tests and inspections not explicitly indicated as Owner's responsibility are the Contractor's responsibility.
 - 1. Where services are the Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
- C. Manufacturer's field services.
- D. Associated Services: Access to the Work, taking and storing samples, and delivery of samples to testing agency.

- E. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
- F. Test and inspection log.
- G. Repair and Protection: Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

1.1 SUMMARY

A. Temporary Facilities:

1. Common-Use Field Office: Prefabricated or mobile units, including meeting room.
2. Storage and fabrication sheds.

B. Temporary Utilities:

1. Sewers and drainage.
2. Electric Power Service: Pay electric power service use charges for electricity used by all entities engaged in construction activities at Project site.
3. Water Service: Pay water service use charges for water used by all entities engaged in construction activities at Project site.
4. Sewer and Storm Sewer Service: Pay sewer and storm sewer service use charges for sewer usage, by all parties engaged in construction at Project site.
5. Sanitary Facilities: Toilets, wash facilities, and drinking water.
6. Heating and cooling facilities.
7. Ventilation and humidity control.
8. Lighting, including exterior-yard site lighting.
9. Telephone Service: At each field office and superintendent's cell phone.
10. Electronic communication service including electronic mail and fax.

C. Support Facilities:

1. Temporary Roads and Paved Areas: Located within construction limits.
2. Traffic controls.
3. Parking: Contractor provided.
4. Dewatering facilities and drains.
5. Project identification and temporary signs.
6. Waste disposal facilities, including a waste management plan for recycling waste materials.
7. Lifts and hoists.

D. Security and Protection Facilities:

1. Environmental protection.
2. Temporary erosion and sedimentation control.
3. Stormwater control.
4. Tree and plant protection.
5. Site Enclosure Fence: Chain link.
6. Security enclosure and lockup.
7. Barricades, warning signs, and lights.
8. Temporary enclosures.
9. Temporary Partitions: Dustproof, gypsum wallboard over one side of studs.

10. Temporary Fire Protection: Fire extinguishers.

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

1.1 SUMMARY

- A. Product delivery, storage, and handling.
- B. Requirements for products used on Project.
- C. Construction guarantees and warranties.
- D. Product substitutions.

1.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft.
- B. Storage: Secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces.

1.3 PRODUCT REQUIREMENTS

- A. Product Requirements: Comply with Owner's requirements.

1.4 CONSTRUCTION GUARANTEES AND WARRANTIES

- A. Guarantees and Warranties: Comply with Owner's requirements.

1.5 PRODUCT SUBSTITUTIONS

- A. Conditions:
 - 1. Offers Owner a substantial advantage in cost, time, energy conservation after deducting additional responsibilities Owner must assume.
 - 2. Does not require extensive revisions to the Contract Documents.
 - 3. Consistent with the Contract Documents and will produce indicated results.
 - 4. Fully documented and properly submitted.
 - 5. Will not adversely affect Contractor's Construction Schedule.
 - 6. Has received necessary approvals of authorities having jurisdiction.
 - 7. Compatible with other portions of the Work.
 - 8. Provides specified warranty.

END OF SECTION 016000

SECTION 017300 - EXECUTION

1.1 SUMMARY

- A. Construction layout.
- B. Field engineering and surveying.
- C. General installation of products.
- D. Coordination of Owner-installed products.
- E. Progress cleaning.
- F. Starting and adjusting.
- G. Protection of installed construction.
- H. Correction of the Work.

1.2 EXECUTION

- A. Existing Conditions: Existence and location of site improvements, utilities, and other construction affecting the Work must be investigated and verified.
- B. Clarification of the Contract Documents: Owner's RFI form.
- C. Construction Layout: Work laid out by land surveyor registered in Utah, using accepted surveying practices; record log maintained.
- D. Field Engineering: Owner will provide property survey.
 - 1. Benchmarks: Two permanent benchmarks established on Project site.
- E. Installation: Manufacturer's written instructions for installing products.
- F. Owner-Installed Products: Contractor coordinates the Work with work performed by Owner's construction forces.
- G. Progress Cleaning: Project site and work areas cleaned daily. Burying or burning waste materials on-site not permitted.
 - 1. Landfill receipts for hazardous waste disposal.
- H. Starting and Adjusting: Equipment and operating components started, adjusted, and tested to confirm proper operation. Malfunctioning units replaced with new units.
- I. Protection of Installed Construction: Maintained until time of Substantial Completion.

J. Correction of the Work: Defective construction repaired or replaced.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

1.1 SUMMARY

- A. Cutting and patching required by the following:
 - 1. Installation of other materials.
 - 2. Finishing.
 - 3. Alterations.
 - 4. Tests and inspections.

1.2 QUALITY ASSURANCE

- A. Limitations: Do not cut and patch structural, operational, or miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
- B. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching.

1.3 EXECUTION

- A. Temporary support of Work being cut.
- B. Cutting: Using hand or small power tools.
- C. Patching: With seams that are as invisible as possible.

END OF SECTION 017329

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

1.1 SUMMARY

- A. Recycling nonhazardous demolition, construction, and land clearing waste.
- B. Disposing of nonhazardous demolition, construction, and land clearing waste.

1.2 PERFORMANCE GOALS

- A. Recycle Goals: Recycle rate of 50 percent minimum in accordance with the DFCM High Performance Building Rating System.

1.3 WASTE MANAGEMENT PLAN

- A. Types and quantities of demolition, construction, and land clearing waste.
- B. Type of waste and whether it will be recycled, salvaged, composted, or disposed of in landfill or incinerator.
- C. Net additional cost or net savings resulting from waste management plan.

1.4 RECYCLING WASTE

- A. Recycling Incentives: Revenues and other incentives for recycling will accrue to Contractor.

1.5 WASTE DISPOSAL

- A. General: Except for items or materials to be recycled, or otherwise reused, remove waste materials from Project site.
 - 1. Burning: Do not burn waste materials.
 - 2. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

1.1 SUMMARY

- A. Inspection procedures.
- B. Warranties.
- C. Final cleaning.

1.2 PROCEDURES

- A. Substantial Completion: Before inspection:
 - 1. Comply with Owner's requirements for Substantial Completion.
 - a. Substantial Completion Form: Owner's form.
 - 2. List of incomplete items (punch list).
 - 3. Owner advised of insurance changeover.
 - 4. Spare parts and extra materials delivered.
 - 5. Final changeover of locks performed.
 - 6. Startup testing completed.
 - 7. Test/adjust/balance records submitted.
 - 8. Temporary facilities removed.
 - 9. Owner advised of utility changeover.
 - 10. Final cleaning performed.
 - 11. Touchup performed.
 - 12. Coordination with commissioning requirements.
- B. Final Completion: Before final inspection:
 - 1. Comply with Owner's requirements for Final Payment.
 - 2. Final Application for Payment submitted.
 - 3. List of incomplete items (punch list) endorsed by Architect as completed.
 - 4. Consent of Surety to Final Payment.
 - 5. Project Record Documents submitted in digital and paper copy.
 - 6. Warranties submitted.
 - 7. Project operation and maintenance manuals submitted.
 - 8. Evidence of continuing insurance coverage submitted.
 - 9. Releases, occupancy permits, and operating certificates obtained.
 - 10. Owner's personnel instructed in operation, adjustment, and maintenance of equipment and systems, including demonstration and training videotapes submitted.
- C. Warranties:

1. Organized and bound in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, with paper dividers. Binder front and spine identified with title, Project name, and name of Contractor.
 2. Comply with DFCM requirements for warranties.
- D. Final Cleaning: Each surface or unit cleaned to condition expected in an average commercial building cleaning and maintenance program.
1. Clean ducts, blowers, and coils for units operated without filters during construction.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

1.1 SUMMARY

- A. Emergency operation and maintenance manuals.

1.2 PRODUCTS

- A. Manuals: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, minimum four copies.
- B. Emergency Manuals: Types of emergencies, emergency instructions, and emergency procedures.
- C. Operation Manuals: System and equipment descriptions, operating procedures, wiring diagrams, control diagrams and sequence of operation, and piped system diagrams.
- D. Product Maintenance Manuals: Source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds.
- E. System and Equipment Maintenance Manuals: Source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

1.1 SUMMARY

- A. Record drawings and specifications.
- B. Record modifications including addenda, change orders, and other modifications.
- C. Record submittals including approved shop drawings, product data, samples, and similar submittals.

1.2 SUBMITTALS

- A. Record Documents: One set submitted to Owner at completion of project.

1.3 PRODUCTS

- A. Record Documents: Marked weekly to record changes and selections make during construction.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

1.1 SUMMARY

- A. Demonstration and training in operation and maintenance of operation of systems and equipment.
- B. Demonstration and training videotapes.

1.2 INSTRUCTION PROGRAM

- A. Program Structure: Training modules for each system and equipment not part of a system, including the following:
 - 1. Basis of system design, operational requirements, and criteria.
 - 2. Documentation.
 - 3. Emergencies.
 - 4. Operations.
 - 5. Adjustments.
 - 6. Troubleshooting.
 - 7. Maintenance.
 - 8. Repairs.
- B. Facilitator to prepare instruction program and training modules.

END OF SECTION 017900

SECTION 033000 - CAST-IN-PLACE CONCRETE

1.1 SUMMARY

- A. Cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.

1.2 QUALITY ASSURANCE

- A. Quality Standard: ACI 301.

1.3 MATERIALS

- A. Form-facing materials.
 - 1. Smooth-Formed Finished Concrete: Medium density overlay panels (5 by 10 ft) Class I or better, mill-release agent treated and edges sealed.
 - 2. Rough-Formed Finished Concrete: Plywood, metal, or other approved material.
- B. Steel Reinforcement:
 - 1. Reinforcing Bars: Deformed, ASTM A615 grade 60 typical.
 - 2. Welded Wire Reinforcement: Plain.
- C. Concrete Materials:
 - 1. Portland Cement: ASTM C 150, Type I/II, gray, supplemented with class F fly ash, 25% maximum.
 - 2. Aggregate: ASTM C33 Normal weight typical.
 - 3. Water.
 - 4. Admixtures: Air entraining; Water reducing; Retarding; Water reducing and retarding, High range, water reducing, High range, water reducing and retarding, Plasticizing and retarding. Admixtures shall comply with ASTM C260 for air entrained concrete.
- D. Vapor Retarders: Class A sheet.
- E. Curing Materials: Clear, waterborne, chemical curing compound that does not interfere with bonding of finish floor materials.
- F. Floor and Slab Treatments At Exposed Concrete Floors: Penetrating liquid curing, sealing, and hardening floor treatment.

- G. Related Materials: Expansion- and isolation-joint-filler strips, reglets, dovetail anchor slots.
- H. Repair Materials: Underlayment and overlayment.

1.4 CONCRETE MIXTURES

- A. Minimum compressive Strength (28 Days):
 - 1. Footings: 3000 psi.
 - 2. Foundation Walls: 4000 psi.
 - 3. Slabs-on-Grade: 4000 psi.
- B. Mixing: Ready mixed.

1.5 INSTALLATION

- A. Formed-Surface Finish: Rough-formed at unexposed surfaces. Smooth-formed at exposed surfaces.
- B. Vapor Retarder: Provide under floor areas receiving moisture sensitive flooring including resilient flooring.
- C. Floor and Slab Finishes:
 - 1. Float: Surfaces to receive trowel finish.
 - 2. Trowel: Surfaces exposed to view, and surfaces to be covered with resilient flooring, carpet, ceramic tile set over a crack isolation membrane, paint, and thin film-finish coating systems.
 - 3. Trowel and Fine Broom: Surfaces to be covered with ceramic tile installed by thickset method.
 - 4. Medium Broom: Exterior concrete platforms, steps, and ramps.

1.6 FIELD QUALITY CONTROL

- A. Testing: By Owner-engaged agency.
- B. Inspections: By Owner-engaged special inspector.

END OF SECTION 033000

SECTION 042000 - UNIT MASONRY

1.1 SUMMARY

A. Masonry Construction:

1. Masonry veneer.

1.2 QUALITY ASSURANCE

- A. Mockups of typical wall areas.

1.3 MATERIALS

A. Brick: Face brick ASTM C 216, SW, FBX.

1. Color: As approved by Owner.
2. Size: 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

B. Masonry Joint Reinforcement:

1. Exterior Walls: Hot-dip galvanized, carbon steel.

C. Ties and Anchors: Galvanized steel.

1. Adjustable Masonry-Veneer Anchors: Screw attached slip-in and seismic with continuous single wire joint reinforcement of minimum wire size W1.7.

D. Embedded Flashing:

1. Concealed (Flexible) Flashing: Copper laminated, 5 oz/sq. ft minimum.
 - a. Used with stainless-steel drip edges and flashing terminations.

E. Weep/Vents: Cellular plastic.

F. Cavity Drainage Material: Free-draining polymer mesh.

G. Mortar: Pigmented or natural color as selected by Owner

1. Masonry cement and mortar cement not allowed.

1.4 INSTALLATION

- A. Bond: Running.

1.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner engaged.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL FRAMING

1.1 SUMMARY

- A. Structural-steel framing.

1.2 QUALITY ASSURANCE

- A. Fabricator Qualifications: State of Utah (DFCM) Approved Structural Steel Fabricator/Manufacturer.
- B. Quality Standard: AISC's "Code of Standard Practice for Steel Buildings and Bridges," "Specification for Structural Steel Buildings", and "Specification for Structural Joints Using ASTM A325 or A490 Bolts".

1.3 MATERIALS

- A. Structural-Steel Shapes:
 - 1. W-shapes: ASTM A992, $F_y = 50$ ksi.
 - 2. Channels, angles, M-shapes, S-shapes, plate and bar: ASTM A36, $F_y = 36$ ksi.
 - 3. Cold-formed hollow structural sections: ASTM A500, Grade B.
 - 4. Steel pipe: ASTM A53 Grade B.
- B. Bolts, Nuts, and Washers: ASTM A325..
- C. Anchor Rods: ASTM F1554, Grade 36 with ASTM A563 heavy hex nuts and ASTM F436 hardened washers .
- D. Connectors: Headed Stud Anchors, ASTM A108, with dimensions complying with AISC specifications.
- E. Primer: Fabricator's standard, nonasphaltic.
- F. Grout: Nonmetallic, shrinkage resistant.

1.4 FABRICATION

- A. Shop Connections: Pretensioned high-strength bolts at seismic critical connections, snug-tightened high-strength bolts at all other connections and welded connections.
- B. Surface Preparation: SSPC-SP 3.
- C. Galvanizing: Hot dip.

1.5 INSTALLATION

- A. Field Connections: Pretensioned high-strength bolts at seismic critical connections, snug-tightened high-strength bolts at all other connections and welded connections.

1.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner engaged.

END OF SECTION 051200

SECTION 052100 - STEEL JOIST FRAMING

1.1 SUMMARY

- A. Open-web K-series steel joists for roof framing.
- B. KCS-type, open-web K-series steel joists for roof framing.
- C. K-series steel joist substitutes for roof framing.
- D. LH-series long-span steel joists for roof framing.
- E. Joist girders for roof framing.
- F. Special joists for roof framing, designed by manufacturer.
- G. Joist accessories, including permanent bridging.

1.2 MATERIALS

- A. Bolts: High-strength carbon steel.
 - 1. Finish: Plain, uncoated.
- B. Primer: Manufacturer's standard.
- C. Open-Web K-Series Steel Joists: With top-chord extensions or extended ends as needed.
- D. Joist Girders:
 - 1. End Arrangement: Underslung with bottom-chord extensions.
 - 2. Top-Chord Arrangement: Parallel.

1.3 INSTALLATION

- A. Connections: Welded or Bolted.

1.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage testing agency to inspect field welds and bolted connections.

END OF SECTION 052100

SECTION 053100 - STEEL DECKING

1.1 SUMMARY

- A. Roof deck.

1.2 QUALITY ASSURANCE

- A. Steel roof deck shall comply with the latest requirements of the Steel Deck Institute (SDI).
- B. FMG Listing: Steel roof deck.

1.3 MATERIALS

- A. Roof Deck: Galvanized steel sheet.
 - 1. Profile Depth: 1-1/2 inches or 3 inches, Type B.
- B. Accessories: Flexible closure strips, pour stops, girder fillers, column closures, end closures, Z-closures, and cover plates, recessed sump pans, and flat sump plates.

1.4 INSTALLATION

- A. Roof Deck: Welded.

1.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner engaged.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING

1.1 SUMMARY

- A. Exterior non-load-bearing wall framing.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance:
 - 1. Dead Loads: Self weight of exterior cladding system.
 - 2. Wind Loads: Per ASCE 7-05, 90 mph basic wind speed minimum (3-second gust), exposure category C minimum.
 - 3. Seismic Loads: Per ASCE 7-05, S_{ds} = as determined by location, $a_p = 1.0$, $R_p = 2.5$, Seismic Design Category D minimum.
 - 4. Deflection Limits: $\leq 1/360$.
- B. Engineering design of cold-formed metal framing by Contractor.

1.3 QUALITY ASSURANCE

- A. Design Standard: AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1.4 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, metallic coated.
- B. Exterior Non-Load-Bearing Wall Framing: Standard C-shaped, punched steel studs and U-shaped, unpunched track.
 - 1. Minimum Steel Thickness: 0.0428 inch (1.09 mm).
 - 2. Connection to structure shall accommodate vertical deflection and horizontal inter-story drift with vertical deflection clips, single deflection track, drift clips and Double deflection track.
- C. Framing Accessories: Supplementary framing, bracing, bridging, solid blocking, web stiffeners, stud kickers and girts.
- D. Insulation for inaccessible voids.

1.5 INSTALLATION

- A. Fasten framing by welding or screw fastening.

1. Exterior Non-Load-Bearing Wall Stud Spacing: 16 inches (406 mm).

1.6 FIELD QUALITY CONTROL

- A. Testing: By Owner-engaged agency.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

1.1 SUMMARY

- A. Miscellaneous metal framing and supports.
- B. Loose metal plates and shapes.
- C. Miscellaneous fabricated metal items.

1.2 PRODUCTS

- A. Materials: Steel plates, shapes, and bars. Steel tubing and pipe. Galvanize at exterior locations.
- B. Miscellaneous Framing and Supports:
 - 1. Steel framing and supports for items including; operable partitions, overhead doors, countertops, mechanical and electrical equipment, applications where framing and supports are not specified in other Sections.
- C. Loose steel lintels.
- D. Shelf angles.
- E. Loose bearing and leveling plates.
- F. Steel weld plates and angles not specified in other Sections, for casting into concrete.
- G. Structural-Steel Door Frames:
 - 1. Galvanize exterior locations.
 - 2. Prime interior locations with zinc-rich primer.
- H. Metal Ladders: Steel.
 - 1. Prime interior locations with zinc-rich primer.
- I. Metal Bollards: Schedule 40 galvanized steel pipe.

END OF SECTION 055000

SECTION 055213 - PIPE AND TUBE RAILINGS

1.1 SUMMARY

- A. Steel pipe railings (interior)
- B. Aluminum pipe railings (exterior).
- C. DFCM Design Requirement: Members on guards not allowed to create ladder effect.

1.2 FABRICATION

- A. Connections: Welded.

1.3 FINISHES

- A. Steel: Primed with universal shop primer.
- B. Aluminum: Power-coated.
 - 1. Color: As approved by Owner.

END OF SECTION 055213

SECTION 057500 - DECORATIVE FORMED METAL

1.1 SUMMARY

A. Formed-Metal Items Include:

1. Closures and trim.

1.2 MATERIALS

A. Closures and Trim: Aluminum.

1.3 FINISHES

A. Aluminum: High-performance organic finish.

END OF SECTION 057500

SECTION 061000 - ROUGH CARPENTRY

1.1 SUMMARY

- A. Wood blocking and nailers.
- B. Plywood backing panels.

1.2 MATERIALS

- A. Wood-Preservative-Treated Lumber:
 - 1. Preservative Treatment: AWPA C2 with chemicals containing no arsenic or chromium.
 - 2. Application: Items include:
 - a. Items in contact with roofing.
 - b. Items in contact with concrete or masonry.
- B. Fire-Retardant-Treated Materials:
 - 1. Interior Type A, unless otherwise indicated.
 - 2. Application: Items include:
 - a. Where required by building code.
 - b. Plywood backing panels.
- C. Dimension Lumber Framing:
 - 1. Maximum Moisture Content: 19 percent.
 - 2. Blocking and Nailers: Construction or No. 2 grade Douglas fir-larch.
- D. Plywood backing panels for telephone and electrical equipment.
- E. Fasteners: Hot-dip galvanized steel where exposed to weather, in ground contact, in contact with treated wood, or in area of high relative humidity.

END OF SECTION 061000

SECTION 061603 - GYPSUM SHEATHING

1.1 SUMMARY

- A. Gypsum sheathing attached to steel framing members of exterior walls.

1.2 QUALITY ASSURANCE

- A. Fire-resistance ratings were determined by fire-response testing assemblies according to ASTM E 119.

1.3 GYPSUM SHEATHING BOARD

- A. Paper-Surfaced Gypsum Sheathing Board with Water-Resistant Core: ASTM C 79, with water-resistant material incorporated into the core and with water-repellent paper bonded to the core's face, back, and long edges.
 - 1. Type and Thickness: Type X, 5/8 inch thick.
 - 2. Edge and End Configuration: Square.
 - 3. Size: 48 by 96 inches.

1.4 ACCESSORY MATERIALS

- A. Air-Infiltration Barrier: Proprietary building wrap with flame-spread and smoke-developed ratings of less than 25 and 450, respectively, when tested according to ASTM E 84.
 - a. Polyethylene sheet;
 - b. Polypropylene sheet;
 - c. Laminated polyethylene sheet
 - d. Woven polyolefin sheet;

- B. Fasteners: Steel drill screws.

1.5 INSTALLATION

- A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions.

END OF SECTION 061603

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

1.1 SUMMARY

- A. Interior standing and running trim.
- B. Plastic-laminate cabinets.
- C. Plastic-laminate countertops.
- D. Utility shelving.

1.2 QUALITY ASSURANCE

- A. Quality Standard: AWI.

1.3 MATERIALS

- A. Interior Standing and Running Trim:
 - 1. Lumber Trim for Transparent Finish: Red oak or equivalent as approved by Owner.
- B. Cabinet Hardware:
 - 1. Hinges: Frameless, concealed.
 - 2. Pulls: Wire.
 - 3. Locks: Door and drawer where required by Owner.
- C. Plastic-Laminate Cabinets:
 - 1. Grade: Custom.
 - 2. AWI Type of Cabinet Construction: Flush overlay.
 - 3. Cabinet Interior: Thermoset decorative panels.
- D. Plastic-Laminate Countertops:
 - 1. Grade: Custom.
 - 2. Edge Treatment: Plastic laminate.
- E. Utility Shelving: Custom grade. Thermoset decorative panels.
- F. Colors: As approved by Owner.

END OF SECTION 064023

SECTION 072100 - THERMAL INSULATION

1.1 SUMMARY

A. Applications:

1. Perimeter insulation under slabs-on-grade.
2. Perimeter wall insulation (supporting backfill).
3. Concealed building insulation.
4. Vapor retarders.

1.2 MATERIALS

A. Insulation:

1. Extruded-Polystyrene Board: Type IV, 1.60 lb/cu. ft..
2. Unfaced Glass-Fiber Blanket: Type I.

B. Vapor Retarders: Reinforced polyethylene. Fire retardant if required by building code.

C. Auxiliary Insulating Materials:

1. Insulation adhesives and fasteners.

END OF SECTION 072100

SECTION 072416 - DIRECT APPLIED EXTERIOR FINISH SYSTEM (DEFS)

1.1 SUMMARY

- A. Direct-Applied Exterior Finish System (DEFS) applied over glass-mat gypsum board (exterior soffits).

1.2 QUALITY ASSURANCE

- A. Mockups for each form of construction and finish.

1.3 MATERIALS

- A. Glass-Mat Gypsum Board: 5/8 inch thick.
- B. Reinforcing Mesh: Standard.
- C. Primer: Manufacturer's standard.
- D. Base-Coat Materials: Factory-blended polymer-emulsion adhesive and portland cement dry mix to which only water is added.
- E. Finish-Coat Materials: Standard acrylic-based coating.
- F. Trim Accessories: PVC.
- G. Elastomeric Sealants: Multicomponent, nonsag urethane.

1.4 INSTALLATION

- A. Finish Coat: Applied over primer.

END OF SECTION 072416

SECTION 075400 - THERMOPLASTIC MEMBRANE ROOFING - DFCM STANDARD

1.1 SUMMARY

- A. Mechanically fastened membrane roofing system.
- B. Vapor retarder (if required).
- C. Roof insulation.
- D. Comply with Owner's Roofing Requirements for TPO roofing.

1.2 PERFORMANCE REQUIREMENTS

- A. Roofing System Design: Uplift pressures calculated according to ASCE 7.
- B. FMG Listing: Class 1A- 90.

1.3 QUALITY ASSURANCE

- A. Exterior Fire-Test Exposure: Class A.
- B. Preliminary roofing and preinstallation conference.
- C. Comply with Owner's requirements for low slope roofing manufactures.
- D. Comply with Owner's list of approved manufacturers and installers.

1.4 WARRANTY

- A. Manufacturer's Materials and Workmanship Warranty: 20 years.
 - 1. Warranty form: DFCM standard.
- B. Installer's Warranty: 5 years.

1.5 MATERIALS

- A. Thermoplastic Polyolefin Roofing Membrane: Reinforced thermoplastic sheet, complying with ASTM D 6878-03.
 - 1. Thickness: 60 mils (57 mils minimum) polymer thickness, not overall thickness.
- B. Sheet Flashing: Unreinforced thermoplastic polyolefin.

- C. Substrate Board: As required for rating.
- D. Roof Insulation: Polyisocyanurate board.
- E. Cover Board: Glass-mat, water-resistant gypsum substrate.
- F. Walkways: Pads.

1.6 INSTALLATION

- A. Roof Insulation: Mechanically fastened.
- B. Roofing Membrane: Mechanically fastened.
 - 1. Attachment Method for Mechanically Fastened: In splice.

1.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner engaged.

END OF SECTION 075400

SECTION 076200 - SHEET METAL FLASHING AND TRIM

1.1 PERFORMANCE REQUIREMENTS

- A. Roof Edge Flashing and Copings: Capable of resisting forces according to FMG Loss Prevention Data Sheet 1-49.

1.2 QUALITY ASSURANCE

- A. Quality Standard(s): SMACNA's "Architectural Sheet Metal Manual".

1.3 WARRANTY

- A. Fluoropolymer Finishes: 20 years.

1.4 MATERIALS

- A. Sheet Metals:
 - 1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet with smooth, flat surface.
 - a. Coil-Coated Finish: Two-coat fluoropolymer.
 - 1) Color: As approved by Owner.
 - b. Galvanized finish at equipment support curbs.

1.5 PRODUCTS

- A. Manufactured Flashing and Trim:
 - 1. Reglets and Counterflashing: Metallic-coated steel sheet with coil coated finish.
 - a. Types: Surface-mounted.
 - b. Accessories: Flexible-flashing retainer, counterflashing wind-restraint clips.
- B. Formed Low-Slope Roof Fabrications: Including roof-edge flashing, copings, roof expansion-joint covers, counterflashing, flashing receivers, roof-penetration flashing, and roof-drain flashing.
- C. Miscellaneous Formed Fabrications: Including equipment support flashing.

END OF SECTION 076200

SECTION 078413 - PENETRATION FIRESTOPPING

1.1 SUMMARY

- A. Through-penetration firestop systems for penetrations through fire-resistance-rated assemblies.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:
 - 1. F-Rated Systems: F-ratings equaling or exceeding fire-resistance rating of constructions penetrated.
 - 2. T-Rated Systems: For penetrations located outside wall cavities and outside fire-resistance-rated shaft enclosures.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Tested per ASTM E 814 by UL and listed in the UL "Fire Resistance Directory".

1.4 MATERIALS

- A. Fill Materials: Provide fill materials complying with performance and quality assurance requirements.
- B. Accessories: Permanent forming/damming/backing materials, temporary forming materials, substrate primers, collars, and steel sleeves as needed to comply with performance and quality assurance requirements.

1.5 INSTALLATION

- A. Identification: Preprinted metal or plastic labels, permanently attached.

1.6 FIELD QUALITY CONTROL

- A. Inspection of Installed Firestop Systems: By Owner-engaged agency according to ASTM E 2174 requirements.

END OF SECTION 078413

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

1.1 SUMMARY

- A. Fire-resistive joint systems for the following:
 - 1. Head-of-wall joints.
 - 2. Wall-to-wall joints.

1.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings of Joint Systems in and between Fire-Resistance-Rated Constructions: Equaling or exceeding the fire-resistance ratings of construction that they join, and movement capabilities indicated, as determined by ASTM E 1966 or UL 2079.
- B. Ratings of Perimeter Fire-Resistive Joint Systems: As indicated, determined by ASTM E 119.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Tested by UL.

1.4 MATERIALS

- A. Materials: Fill materials, forming materials, and other components complying with performance and quality assurance requirements.

1.5 FIELD QUALITY CONTROL

- A. Testing: By Owner-engaged agency.

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

1.1 SUMMARY

- A. Exterior Joints in Vertical Surfaces and Horizontal Nontraffic Surfaces include:
 - 1. Control and expansion joints in unit masonry.
 - 2. Perimeter joints around frames of doors, windows, and louvers.
- B. Exterior Joints in Horizontal Traffic Surfaces include:
 - 1. Isolation and contraction joints in cast-in-place concrete slabs.
- C. Interior Joints in Vertical Surfaces and Horizontal Nontraffic Surfaces include:
 - 1. Control and expansion joints on exposed interior surfaces of exterior walls.
 - 2. Perimeter joints of exterior openings.
 - 3. Vertical joints on exposed surfaces of interior walls and partitions.
 - 4. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - 5. Joints between plumbing fixtures and adjoining walls, floors, and counters.
- D. Interior Joints in Horizontal Traffic Surfaces include:
 - 1. Isolation joints in cast-in-place concrete slabs.
 - 2. Control and expansion joints in tile flooring.

1.2 QUALITY ASSURANCE

- A. Preconstruction compatibility, adhesion, and stain testing.
- B. Product testing.
- C. Preconstruction field-adhesion and stain testing.
- D. Mockups.

1.3 WARRANTY

- A. Installer: Two years.
- B. Manufacturer: Two years.

1.4 MATERIALS

- A. Elastomeric Joint Sealants: Liquid applied, chemically curing; ASTM C 920.

1. Neutral-curing silicone sealants.
2. Nonsag and pourable urethane sealants.
3. Mildew-resistant neutral-curing silicone sealants.

B. Latex Joint Sealants: ASTM C 834, Type P, Grade NF.

C. Acoustical Joint Sealants: Latex.

D. Joint-Sealant Backing: Cylindrical.

1.5 FIELD QUALITY CONTROL

- A. Field-adhesion testing for sealant adhesion to joint substrates.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

1.1 SUMMARY

- A. Standard hollow metal doors and frames.

1.2 QUALITY ASSURANCE

- A. Standard Hollow Metal Quality Standard: ANSI/SDI A250.8.
- B. Fire-Rated Doors and Frames: Positive-pressure testing.

1.3 PRODUCTS

- A. Standard Hollow Metal Doors:

- 1. Design: Flush panel.
- 2. Thermal-Rated Doors: Exterior.
- 3. Exterior Doors: Metallic-coated steel sheet faces.
 - a. Level 2 and Physical Performance Level B (Heavy Duty).
 - b. Model: 1 (Full Flush).
- 4. Interior Doors: Cold-rolled steel sheet faces.
 - a. Level 2 and Physical Performance Level B (Heavy Duty).
 - b. Model: 1 (Full Flush).

- B. Standard Hollow Metal Frames:

- 1. Exterior Frames: Metallic-coated steel sheet; full profile welded.
 - a. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.
- 2. Interior Frames: Cold-rolled steel sheet; full profile welded.
 - a. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.
 - b. Frames for Wood Doors: 0.053-inch- thick steel sheet.
 - c. Frames for Borrowed Lights: 0.053-inch- thick steel sheet.

- C. Accessories:

- 1. Moldings and stops for glazed lites.
- 2. Louvers: Steel.

- D. Finishes: Factory priming for field painting.

1.4 INSTALLATION

- A. Metal-Stud Partitions: Frames filled with insulation.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

1.1 QUALITY ASSURANCE

- A. Quality Standard: WDMA.
- B. Fire-Rated Wood Doors: Positive pressure testing.

1.2 WARRANTY

- A. Materials and Workmanship: Includes repair or replacement, and installation and finishing that may be required due to repair or replacement of defective doors.
 - 1. Solid-Core Interior Doors: Life of installation.

1.3 DOOR CONSTRUCTION, GENERAL

- A. WDMA I.S.1-A Performance Grade:
 - 1. Heavy Duty.

1.4 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
 - 1. Grade: Premium (Grade A faces).
 - 2. Species and Cut: Red oak, plain sliced (flat sliced), or equivalent approved by Owner.
 - 3. Match between Veneer Leaves: Book match.
 - 4. Assembly of Veneer Leaves on Door Faces: Balance match.
 - 5. Special Matching:
 - a. Pair and set match.
 - 6. Core: Particleboard.
 - 7. Construction: Five or seven plies, bonded.
- B. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection ratings.
 - 1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile.
- C. Blocking: Provide blocking as required to eliminate through bolting hardware.

1.5 LOUVERS AND LIGHT FRAMES

- A. Louvers: Steel with baked enamel or powder coated finish.
 - 1. Fire-Door Louvers: Fusible links.
- B. Light-Opening Frames:
 - 1. Wood beads.
 - 2. Wood-veneered beads for fire doors.

1.6 FABRICATION

- A. Fabrication:
 - 1. Factory fit doors to frames.
 - 2. Factory machine doors for hardware.
 - 3. Factory glaze doors.

1.7 FINISHING

- A. Factory Finishing: All doors.
- B. Transparent Factory Finishes:
 - 1. Grade: Premium.
 - 2. Finish: Catalyzed polyurethane.
 - 3. Effect: Open-grain finish.
 - 4. Color: As approved by Owner.

END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

1.1 SUMMARY

- A. Access doors and frames for walls and ceilings.

1.2 QUALITY ASSURANCE

- A. Fire-Rated Vertical Access Doors and Frames: NFPA 252 or UL 10B.
- B. Fire-Rated Horizontal Access Doors and Frames: ASTM E 119 or UL 263.

1.3 PRODUCTS

- A. Access Doors and Frames for Walls and Ceilings:
 - 1. Type:
 - a. Flush access doors and trimless frames.
 - 2. Material: Steel.
 - 3. Fire-Resistance Rating: As required.
 - 4. Latch: Cam latch operated by screwdriver with interior release.
 - 5. Lock: Cylinder where required for security.
 - 6. Size: Minimum 30 inch by 30 inch.
- B. Finishes:
 - 1. Steel: Primed finish.

END OF SECTION 083113

SECTION 083323 - OVERHEAD COILING DOORS

1.1 SUMMARY

- A. Electric-motor-operated overhead coiling doors:
 - 1. Insulated service doors.

1.2 PERFORMANCE REQUIREMENTS

- A. Wind Load: Comply with project requirements.
- B. Seismic Performance: SEI/ASCE 7, "Minimum Design Loads for Buildings and Other Structures."
- C. Operation: Door system that does not pose a safety or injury hazard during operations.

1.3 COMPONENTS

- A. Door Curtain: Aluminum.
 - 1. Slats: Flush.
 - 2. Insulation: Polystyrene or polyurethane foam.
 - 3. Endlocks.
 - 4. Curtain jamb guides.
- B. Hood: Same material as door curtain.
- C. Integral sills.
- D. Seals: Weather.
- E. Electric Door Operation: Operator type as recommended by manufacturer with remote-control station.
 - 1. Obstruction Detection Device: Self monitoring photoelectric.
- F. Finishes:
 - 1. Aluminum: Powder-coat finish.
 - a. Color: As approved by Owner.

END OF SECTION 083323

SECTION 083326 - OVERHEAD COILING GRILLES

1.1 SUMMARY

- A. Electric-motor-operated overhead coiling grilles:

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: SEI/ASCE 7, "Minimum Design Loads for Buildings and Other Structures."
- B. Operation: Door system that does not pose a safety or injury hazard during operations.

1.3 OPEN-CURTAIN GRILLE ASSEMBLY

- A. Aluminum overhead coiling grille with a curtain having a network of horizontal rods that interconnect with vertical links.
- B. Hood: Aluminum.
- C. Electric Door Operation: Operator type as recommended by manufacturer with keyed remote-control station.
 - 1. Obstruction Detection Device: Self monitoring photoelectric.
- D. Finish: Clear anodized.

END OF SECTION 083326

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

1.1 SUMMARY

- A. Exterior and interior storefront framing.
- B. Exterior and interior manual-swing entrance doors and door-frame units.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Contractor to design aluminum-framed systems.
- B. Structural Performance:
 - 1. Wind Loads: Comply with project requirements.
 - 2. Seismic Loads: Comply with project requirements.
- C. Deflection of Framing Members:
 - 1. Deflection Normal to Wall Plane: Limited to L/175.
 - 2. Deflection Parallel to Glazing Plane: Limited to L/360 or 1/8 inch, whichever is smaller.

1.3 QUALITY ASSURANCE

- A. Accessibility Requirements: Provide installed hardware that complies with U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)," and ICC/ANSI A117.1.

1.4 WARRANTY

- A. Materials and Workmanship: Two years.
- B. Finish: Two years.

1.5 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer.
- B. Steel reinforcement where required.

1.6 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members.
 - 1. Construction: Thermally broken.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Center.
- B. Brackets and reinforcements.
- C. Fasteners and accessories.
- D. Concrete and masonry inserts.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing.
- F. Framing system gaskets and sealants.

1.7 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing."
- B. Glazing gaskets.
- C. Spacers and setting blocks.

1.8 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors:
 - 1. Door Construction: 1-3/4-inch overall thickness.
 - 2. Door Design: Medium stile.
 - 3. Glazing stops and gaskets.
- B. Entrance Door Hardware: As indicated.

1.9 ALUMINUM FINISHES

- A. Aluminum Finishes: High-performance organic (two coats).
 - 1. Color: As approved by Owner.

1.10 DOOR HARDWARE SETS

- A. Manufacturer's standard commercial quality hardware including:

1. Continuous gear hinges.
2. Thresholds.
3. Push/pull devices.
4. Locking devices.
5. Stops.
6. Weatherseals.

B. Hardware specified in Division 8 Section "Door Hardware" includes:

1. Cylinders.
2. Closers.
3. Exit devices.

END OF SECTION 084113

SECTION 087100 - DOOR HARDWARE

1.1 SUMMARY

- A. Commercial door hardware for swinging doors.
- B. Cylinders for doors specified in other Sections.
- C. Electrified door hardware.

1.2 WARRANTY

- A. Materials and Workmanship: Three years.

1.3 PRODUCTS

- A. Hinges:
 - 1. Exterior: Stainless steel.
 - 2. Interior: Steel.
 - 3. Fire-Rated Assemblies: Steel.
 - 4. Options: Nonremovable pins at outswinging locked doors.
- B. Mechanical Locks and Latches:
 - 1. Bored Locks: Grade 1, Series 4000.
- C. Auxiliary Locks and Latches: Grade 1.
 - 1. Push-Button Combination Locks: Grade 1 for cylindrical locks.
- D. Electromagnetic Locks: 1000-lbf strength ranking.
- E. Door Bolts:
 - 1. Automatic and Self-Latching Flush Bolts: Grade 1.
- F. Exit Devices: Grade 1.
 - 1. Panic exit devices.
 - 2. Fire exit devices.
 - 3. Removable mullions.
 - 4. Outside Trim: Match locksets and latchsets.
 - 5. Electronic exit bars.
- G. Cylinders and Keying:

1. Cylinders: Standard.
 - a. Grade 1.
 - b. Number of Pins: Six.
 - c. Cores: Interchangeable.
 2. Construction Keying: Construction cores.
 3. Keying System:
 - a. Key system to Owner's requirements including master, grand master, and great-grand master key as applicable.
 - b. Keys: Nickel silver.
- H. Key-Control System:
1. Cabinet: Grade 1, multiple drawer, wall mounted.
- I. Electric Strikes: Grade 1.
- J. Operating Trim: Stainless steel.
- K. Closers:
1. Surface: Grade 1.
 2. Coordinators.
- L. Protective Trim Units: Stainless steel.
- M. Stops and Holders:
1. Stops and Bumpers: Grade 1.
 2. Electromagnetic door holders for fire door assemblies.
 3. Silencers for metal door frames.
- N. Door Gasketing: Perimeter, and meeting stile. Smoke labeled, fire labeled, and sound rated, as required.
- O. Thresholds.
- P. Miscellaneous Door Hardware: Boxed power supplies.
- Q. Finishes: Satin chrome.
- 1.4 FIELD QUALITY CONTROL
- A. Independent Architectural Hardware Consultant: Contractor engaged to perform inspections.
 - B. Occupancy Adjustment: Six months.

1.5 DOOR HARDWARE SETS

- A. Comply with Owner's requirements.

END OF SECTION 087100

SECTION 087113 - AUTOMATIC DOOR OPERATORS

1.1 SUMMARY

- A. Low-energy, power-open door operators. Provide at locations as required by Owner.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.
- B. UL Standard: Comply with UL 325.

1.3 WARRANTY

- A. Special Warranty: Failure in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

1.4 LOW-ENERGY, POWER-OPEN DOOR OPERATORS

- A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated
- B. Standard: Comply with BHMA A156.19.
- C. Operation: Power opening and spring closing.
- D. Operating System: Electromechanical.
- E. Microprocessor Control Unit: Solid-state controls.
- F. Mounting: Surface.
- G. Wall Push-Plate Switch: Manufacturer's standard semiflush, wall-mounted or frame-mounted, door control switch.
- H. Cover Finish: Class II, Color Anodic Finish.

END OF SECTION 087113

SECTION 088000 - GLAZING

1.1 SUMMARY

A. Glazing required for the following:

1. Windows.
2. Doors.
3. Glazed entrances.
4. Interior borrowed lites.
5. Storefront framing.

1.2 WARRANTY

- A. Deterioration of Coated Glass: Not less than 10 years.
- B. Deterioration of Laminated Glass: Not less than five years.
- C. Deterioration of Insulating Glass: Not less than 10 years.

1.3 MATERIALS

A. Glass Products:

1. Annealed Float Glass: Clear and tinted.
2. Heat-Treated Float Glass: Clear and tinted. Heat strengthened and fully tempered.
3. Coated Float Glass: Pyrolytically coated (low-E).
4. Laminated Glass: With polyvinyl-butyril sheet interlayer.
5. Insulating Glass: Manufacturer's standard dual-seal units.

B. Fire-Resistive Glazing: Monolithic ceramic glazing material.

C. Glazing Tapes: Expanded-cellular type.

1.4 GLASS UNITS

A. Monolithic Float-Glass Units (interior openings):

1. Clear. Safety glazing (fully tempered or laminated) at hazardous locations.
 - a. Thickness: 1/4 inch minimum.

B. Fire-Resistive Glazing:

1. At glazing required to be fire rated. Fire-resistive safety glazing at hazardous locations.

C. Insulating-Glass Units (exterior openings):

1. Tinted, with low-E coating. Annealed or heat-strengthened as required. Safety glazing (fully tempered or laminated) at hazardous locations.
 - a. Lite thickness: 1/4 inch minimum.
 - b. Overall thickness: 1 inch.
 - c. Color and performance characteristics: As approved by Owner.

END OF SECTION 088000

SECTION 089000 - LOUVERS AND VENTS

1.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Contractor to design louvers.
- B. Wind Loads: Comply with project requirements.

1.2 PRODUCTS

- A. Fixed, Extruded-Aluminum Louvers:
 - 1. Horizontal, Drainable-Blade Louver: 4 inches deep minimum with exposed mullions.
- B. Louver Screens:
 - 1. Provided at each exterior louver.
 - 2. Screening Type: Bird screening.
- C. Blank-Off Panels: Insulated.
- D. Finishes:
 - 1. Aluminum: Two-coat fluoropolymer.

END OF SECTION 089000

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

1.1 SUMMARY

- A. Non-load-bearing steel framing members for interior framing and suspension systems.

1.2 MATERIALS

A. Suspension Systems:

- 1. Wire hangers.
- 2. Grid suspension systems for ceilings.

B. Steel Framing for Framed Assemblies:

1. Studs and runners:

- a. Thickness: Minimum 25 gauge, but not less than required for height and application. Minimum 20 gauge at walls supporting ceramic tile.
- b. Spacing: Maximum 24 inches o.c., except maximum 16 inches o.c. at walls supporting tile.
- c. Width: Minimum 3-5/8 inches. Minimum 6 inches at walls supporting ceramic tile.

2. Slip-Type Head Joints:

- a. Single long-leg runner.
- b. Double runner.
- c. Deflection track.
- d. Use where walls extend to structure above.

- 3. Firestop track at fire rated walls.
- 4. Hat-shaped, rigid furring channels where required.
- 5. Resilient furring channels as required for sound ratings.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

1.1 SUMMARY

- A. Interior gypsum board.

1.2 QUALITY ASSURANCE

- A. Mockups for the following:
 - 1. Levels of gypsum board finish for use in exposed locations.

1.3 MATERIALS

- A. Interior Gypsum Board:
 - 1. Type X.
- B. Minimum Thickness: 5/8 inch.
- C. Trim Accessories: Galvanized or aluminum-coated steel sheet or rolled zinc.
 - 1. Corner beads.
 - 2. U-bead, L-bead, LC-bead.
- D. Auxiliary Materials:
 - 1. Steel drill screws: ASTM C 1002, ASTM C 954
 - 2. Sound attenuation blankets: ASTM C 665, Type I.

1.4 INSTALLATION

- A. Gypsum Board Finish Levels:
 - 1. Level 1: Ceiling plenum areas, concealed areas
 - 2. Level 4: Surfaces to receive wallcoverings.
 - 3. Level 5: Painted surfaces receiving semi-gloss finish.

END OF SECTION 092900

SECTION 093000 - TILING

1.1 SUMMARY

- A. Ceramic mosaic, paver, and glazed wall tile.
- B. Stone thresholds installed as part of tile installations.
- C. Metal edge strips installed as part of tile installations.

1.2 QUALITY ASSURANCE

- A. Mockups for each form of construction.

1.3 MATERIALS

- A. Glazed Wall Tile Trim Shapes: Coved base, bullnose cap, bullnose external corner.
- B. Thresholds: Granite.
- C. Crack Isolation Membrane: Chlorinated polyethylene sheet.
- D. Metal Edge Strips: Stainless steel.
- E. Grout Sealer.

1.4 FLOOR TILE INSTALLATION SCHEDULE

- A. Interior Floors on Concrete Slabs on Grade TCNA F125A: Thinset mortar over crack isolation membrane.
 - 1. Tile Type: Unglazed ceramic mosaic
 - a. Size: 2 inches by 2 inches.
 - b. Color: As approved by Owner.
 - 2. Tile Type: Glazed and unglazed paver (porcelain) tile.
 - a. Size: 12 inches by 12 inches.
 - b. Color: As approved by Owner.
 - 3. Mortar: Latex- portland cement mortar bond coat.
 - 4. Grout: Polymer-modified sanded grout. Sealed.

1.5 WALL TILE INSTALLATION SCHEDULE

- A. Interior Walls over Metal Studs TCNA W244: Thinset mortar bed on cementitious backer units.
 - 1. Tile Type: Glazed wall tile.
 - a. Size: 6 inches by 6 inches for wall tile and base.
 - b. Color: As approved by Owner.
 - 2. Mortar: Latex- portland cement mortar bond coat.
 - 3. Grout: Polymer-modified unsanded grout. Sealed.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

1.1 SUMMARY

- A. Acoustical panels and exposed suspension systems.

1.2 QUALITY ASSURANCE

- A. Acoustical Panel Quality Standard: ASTM E 1264.
- B. Metal Suspension System Quality Standard: ASTM C 635.

1.3 MATERIALS

- A. Acoustical Ceiling Panels:
 - 1. Size: 24 by 48 inches.
 - 2. Thickness: 5/8 inch.
 - 3. Type: Non-directional perforated and fissured. Water-felted.
- B. Metal Suspension Systems:
 - 1. Wire hangers, braces, and ties.
 - 2. Seismic perimeter stabilizer bars, struts, and clips.
 - 3. Wide-Face, Capped, Double-Web Steel: Heavy duty.
- C. Metal Edge Moldings and Trim: Roll-formed sheet metal.
- D. Acoustical sealants at perimeter wall angles.

1.4 INSTALLATION

- A. Installation: ASTM C 636, ASCE/SEI 7 (Section 9.6).

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

1.1 PRODUCTS

A. Resilient Base:

1. Material Requirement: Rubber.
2. Style: Cove.
3. Minimum Thickness: 0.125 inch.
4. Height: 4 inches.
5. Outside Corners: Job formed.
6. Inside Corners: Job formed.

B. Resilient Molding Accessory: Rubber.

1. Nosing for carpet.
2. Nosing for resilient floor covering.
3. Reducer strip for resilient floor covering.
4. Joiner for tile and carpet.
5. Transition strips.

C. Installation Materials:

1. Trowelable leveling and patching compounds.
2. Adhesives.
3. Metal edge strips.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

1.1 PRODUCTS

A. Vinyl Composition Floor Tile:

1. Class: Through pattern.
2. Wearing Surface: Smooth.
3. Thickness: 0.125 inch.
4. Size: 12 by 12 inches.
5. Color: As selected by Owner.

B. Installation Materials:

1. Trowelable leveling and patching compounds.
2. Adhesives.

1.2 FLOOR TILE INSTALLATION

- A. Lay tiles square with room axis.**

END OF SECTION 096519

SECTION 096813 - TILE CARPETING (STATE CARPET CONTRACT)

1.1 WARRANTY

- A. Carpet and Backing: Lifetime

1.2 MATERIALS

A. Carpet Tile:

1. Product: Shaw; Constellation (State Carpet Contract), or equivalent as approved by Owner.
2. Fiber Content: EcoSolution Q.
3. Pile Characteristic: Graphic loop.
4. Dye Method: 55 percent solution, 45 percent yarn.
5. Density: 8,727 oz./cu. yd.
6. Pile Thickness: 0.99 inches.
7. Yarn Weight: 24 oz./sq. yd..
8. Primary Backing: Polypropylene.
9. Secondary Backing: EcoWorx.
10. Size: 24 by 24 inches.
11. Color: As approved by Owner.

1.3 INSTALLATION

- A. Installation Method: Releasable adhesive.

END OF SECTION 096813

SECTION 099113 - EXTERIOR PAINTING

1.1 SUMMARY

- A. Surface preparation and the application of paint systems on exterior substrates.

1.2 QUALITY ASSURANCE

- A. Quality Standards: "MPI Approved Products List" and "MPI Architectural Painting Specification Manual."

1.3 EXTERIOR PAINTING SCHEDULE

- A. Galvanized-Metal Substrates:
 - 1. Latex System: MPI EXT 5.3J.
- B. Colors: As approved by Owner.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

1.1 SUMMARY

- A. Surface preparation and the application of paint systems on interior substrates.

1.2 QUALITY ASSURANCE

- A. Quality Standards: "MPI Approved Products List" and "MPI Architectural Painting Specification Manual."

1.3 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner reserves the right to review invoices and delivery records for quantity and quality of paint used.

1.4 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Painted Traffic Surfaces:
 - 1. Latex Floor Enamel System: MPI INT 3.2A.
- B. Steel Substrates:
 - 1. Latex System: MPI INT 5.1Q.
- C. Galvanized-Metal Substrates:
 - 1. Latex System: MPI INT 5.3J.
- D. Gypsum Board Substrates:
 - 1. Latex System: MPI INT 9.2A.
- E. Colors: As approved by Owner.

END OF SECTION 099123

SECTION 101100 - VISUAL DISPLAY SURFACES

1.1 SUMMARY

- A. Visual Display Surfaces:
 - 1. Markerboards.
 - 2. Tackboards.
 - 3. Display rails.
 - 4. Support systems for visual display boards.
 - 5. Tack assemblies for direct application to wall surface.

1.2 WARRANTY

- A. Materials and Workmanship for Porcelain-Enamel Face Sheets: Life of building.

1.3 MATERIALS

- A. Porcelain-Enamel Face Sheet: Manufacturer's standard steel.
- B. Markerboard Assemblies: Porcelain enamel.
- C. Tack Assemblies: Vinyl-fabric faced.
- D. Support System for Visual Display Boards: As recommended by manufacturer.
- E. Tack Assemblies for Direct Application: Vinyl-fabric-faced tack assembly.
- F. Markerboard Accessories:
 - 1. Aluminum frames.
 - 2. Trim: Factory-applied aluminum.
 - 3. Chalktray: Box type.
 - 4. Map rail with display rail, map hooks.
- G. Aluminum Finishes: Class II, color anodic.

1.4 FABRICATION

- A. Visual Display Boards: Factory assembled.

END OF SECTION 101100

SECTION 101400 - SIGNAGE

1.1 SUMMARY

- A. Dimensional characters.
- B. Panel signs.

1.2 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable provisions in ADA Accessibility Guidelines and ICC/ANSI A117.1.

1.3 PRODUCTS

- A. Dimensional Characters:
 - 1. Cast Characters: 12 inch high aluminum with concealed stud mounting.
- B. Panel Signs:
 - 1. Interior Panel Signs:
 - a. Material: Acrylic sheet.
 - b. Raised copy: Machine-cut acrylic characters.
 - c. Panel Sign Frames: PVC or metal.
 - d. Changeable Message Inserts: Transparent covers with paper inserts printed by Owner.
 - e. Braille: Grade 2

1.4 FINISHES

- A. Aluminum: Class I, clear anodized.
- B. Acrylic Sheet: Copy and background colors that are UV and water resistant.
 - 1. Colors: As approved by Owner.

1.5 INSTALLATION

- A. Dimensional Characters: Manufacturer's standard flush mounting.
- B. Wall-Mounted Signs: Two-face tape.

END OF SECTION 101400

SECTION 102113 - TOILET COMPARTMENTS

1.1 SUMMARY

- A. Steel baked enamel (staff restrooms) and solid polymer (public restrooms) units as follows:
 - 1. Toilet Enclosures: Overhead braced.
 - 2. Urinal Screens: Wall hung.

1.2 COMPONENTS

- A. Solid-Polymer Units: High-density polyethylene (HDPE) or polypropylene (PP) panel material with integral hinges.
- B. Brackets (Fittings):
 - 1. Stirrup Type (Steel Partitions): Chrome-plated, nonferrous, cast zinc alloy (zamac) or clear anodized aluminum.
 - 2. Full-Height (Continuous) Type (Solid Polymer Partitions): Aluminum.
- C. Hardware and Accessories: Chrome-plated, nonferrous, cast zinc alloy (zamac) or clear anodized aluminum.
- D. Mounting: Mounted to reinforced wall plates for support

END OF SECTION 102113

SECTION 102226 - OPERABLE PARTITIONS

1.1 SUMMARY

- A. Section Includes:
 - 1. Manually operated, paired acoustical panel partitions.

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: ASCE/SEI 7, "Minimum Design Loads for Buildings and Other Structures."

1.3 QUALITY ASSURANCE

- A. Flame-Spread Index: 25 or less.

1.4 MATERIALS

- A. Frame: Steel.
- B. Face/Liner Sheets: Steel sheet with gypsum board.

1.5 OPERABLE ACOUSTICAL PANELS

- A. Panel Width: Standard widths.
- B. STC: Not less than 50.
- C. Panel Weight: 8 lb/sq. ft. maximum.
- D. Panel Thickness: Not less than 3 inches.
- E. Hardware: Concealed hinges.
- F. Finish Facing: Vinyl-coated fabric wall covering.

1.6 ACCESSORIES

- A. Pass Doors.

END OF SECTION 102226

SECTION 102800 - TOILET ACCESSORIES

1.1 SUMMARY

A. Public-Use Washroom Accessories:

1. Toilet tissue dispensers - Owner furnished contractor installed (OFCl).
2. Paper towel dispensers (OFCl).
3. Waste receptacle (OFCl).
4. Liquid-soap dispensers (OFCl).
5. Sanitary napkin and tampon dispensers (OFCl).
6. Toilet seat cover dispensers (OFCl).
7. Grab bars.
8. Sanitary-napkin disposal units.
9. Shelf units.
10. Framed mirror unit (stainless steel frame).
11. Material: Stainless steel.

B. Childcare Accessories:

1. Diaper-changing station.
2. Material: High-density polyethylene.

C. Underlavatory guards.

1. Material: Molded plastic.

D. Custodial Accessories:

1. Utility shelf.
2. Mop and broom holder.
3. Material: Stainless steel.

1.2 WARRANTY

- A. Silver Spoilage for Mirrors: 15 years.

END OF SECTION 102800

SECTION 104413 - FIRE EXTINGUISHER CABINETS

1.1 PRODUCTS

A. Fire Protection Cabinet:

1. Type: For fire extinguisher.
2. Construction: Nonrated. Fire rated where required.
3. Mounting: Semirecessed with rolled edge.
4. Door Style: Fully glazed panel with frame.
5. Door Glazing: Acrylic sheet.
6. Accessories: Door locks with safety release.
7. Finish: Steel, baked enamel or powder coated.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

1.1 QUALITY ASSURANCE

- A. Fire Extinguishers: NFPA 10.

1.2 PRODUCTS

- A. Portable, Hand-Carried Fire Extinguishers:

- 1. Multipurpose dry-chemical type, steel container.
 - a. Rating: Minimum 4A-60BC, 10 lb.
 - b. Finish: Baked enamel.

END OF SECTION 104416

SECTION 105113 - METAL LOCKERS

1.1 PRODUCTS

A. Knocked-Down, Standard Metal Lockers:

1. Arrangement: Double tier.
2. Width: 12 inches.
3. Height: 72 inches.
4. Depth: 18 inches.
5. Material: Cold-rolled steel sheet.
6. Body: 24 gauge steel sheet.
7. Door: 16 gauge steel sheet.
8. Door Style: Louvered vents top and bottom.
9. Hinges: Knuckle.
10. Door Handle and Latch: Projecting, multipoint latch, padlock hasp.
11. Equipment: Hooks (1 double ceiling, 2 single side) for each locker.
12. Accessories: Filler panels, finished end panels, number plates.
13. Finish: Baked enamel or powder coat.
 - a. Color: As approved by Owner.

END OF SECTION 105113

SECTION 107500 - FLAGPOLES

1.1 PERFORMANCE REQUIREMENTS

- A. Wind Loads: Comply with project requirements.
- B. Engineering design of flagpole by manufacturer.

1.2 PRODUCTS

- A. Flagpoles:
 - 1. Exposed Height: 30 feet.
 - 2. Aluminum Flagpoles: Cone tapered, with clear anodized finish.
 - a. Color: As approved by Owner.
- B. Mounting Type:
 - 1. Foundation tube.
- C. Fittings:
 - 1. Finial: Ball.
 - 2. Halyard: Internal.

END OF SECTION 107500

SECTION 111300 - LOADING DOCK EQUIPMENT

1.1 PRODUCTS

A. Dock Lifts: MH 29.1.

1. Rated Capacity: 5,000 lb.
2. Platform Surface: Nonskid, safety-tread deck plate.
3. Platform Size: 6 by 8 ft.
4. Handrails: Removable, with safety chains at open ends.
5. Bridge Material: Nonskid, safety-tread steel plate.
6. Bridge Locations: Ends.
7. Vertical Travel: 58 inches.
8. Travel Speed: 12 ft./min.
9. Operation: Hydraulic.
10. Mounting: Pit.
11. Finish: Painted.

END OF SECTION 111300

SECTION 115213 - PROJECTION SCREENS

1.1 MATERIALS

A. Manually Operated Projection Screens:

1. Bracket-mounted or ceiling-suspended, metal-encased screens.

B. Front-Projection Screen Material: Matte-white viewing surface.

1. Size: 84 by 84 inches.

END OF SECTION 115213

SECTION 115216 - PROJECTOR MOUNTS

1.1 SUMMARY

- A. Fixed, structure mounted video projector mounts.

1.2 PRODUCTS

- A. Projector Mount: Steel assembly with tilt, leveling, and 360 deg. rotation. Compatible with Owner's equipment.
 - 1. Finish: Provide manufacturer's standard finish.
 - a. Color: As approved by Owner.
- B. Mounting Accessories: Provide manufacturer's standard anchors, fasteners, framing, and bracing necessary for a complete installation.

C. INSTALLATION

- D. Install mounts in compliance with audio visual equipment mount manufacturer's installation instructions.

END OF SECTION 115216

SECTION 122113 - HORIZONTAL LOUVER BLINDS

1.1 SUMMARY

- A. Horizontal louver blinds with aluminum slats.

1.2 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Passes NFPA 701.

1.3 PRODUCTS

- A. Horizontal Louver Blinds, Aluminum Slats:
 - 1. Nominal Slat Width: 1 inch.
 - 2. Tilt Control: Manual with wand.
 - 3. Lift Operation: Manual with cord.
 - 4. Valance.

1.4 INSTALLATION

- A. Mounting: Method as required for specific condition.

END OF SECTION 122113

SECTION 129300 - SITE FURNISHINGS

1.1 SUMMARY

- A. Bike racks.
- B. Benches.
- C. Waste receptacles.
- D. Ash urns.

1.2 PRODUCTS

- A. Bike Racks: One-piece seamless steel pipe serpentine type with 7 bike capacity.
- B. Benches: Seamless steel pipe frame with metal or plastic wood slat seat. Natural wood not allowed.
- C. Waist Receptacles: Pre-cast concrete housing with standard galvanized trash receptacle.
- D. Ash Urns: Stainless steel housing with stainless steel ash urn.

1.3 FINISHES

- A. Provide manufacturers standard U.V. resistant, polyester powder coat finish system.
 - 1. Color: As approved by Owner.

END OF SECTION 129300

SECTION 211313 - FIRE PROTECTION SYSTEMS

1.1 SUMMARY:

- A. The Contractor shall furnish all materials, equipment and supplies and perform all work and operations to construct and make functional the fire protection systems in accordance code and standards.
- B. Refer to applicable sections in 230000 for work relating to this section.

1.2 QUALITY ASSURANCE:

- A. Utah State Fire Marshall
- B. Division of Facilities and Construction Management
- C. Project Architect / Engineer
- D. NFPA 13 2006
- E. NFPA 14 2006
- F. NFPA 24 2006
- G. NFPA 25 2006
- H. IBC International Building Code 2006
- I. IFC International Fire Code 2006
- J. Underwriters Laboratories Publication, "Fire Protection Equipment Directory".
- K. Factory Mutual Engineering Corp., "Approved Equipment List."

1.3 SCOPE OF WORK - AUTOMATIC FIRE SPRINKLER SYSTEMS:

- A. Design and install the automatic fire sprinkler system(s) in accordance with NFPA 13.

The Fire Sprinkler Contractor shall submit test results of actual "water flow" capacity in G.P.M. and "static" and "residual" pressures available at the fire water connection to the water main or at the base of the sprinkler riser. Test results shall be submitted prior to submitting sprinkler design shop drawings.

Earthquake sway bracing shall be installed in accordance with IBC and NFPA 13.

Allow for possible water supply deterioration in the future, or initial hydrant flow test error. Allowance should be at least 5 psi below the curve of the test corrected to expected seasonal lows.

1.4 PIPING AND EQUIPMENT - FIRE SPRINKLER SYSTEM:

- A. The piping shall be Schedule 40 for two inches or smaller in diameter and Schedule 10 for greater than two inches in diameter.
- B. Special thin wall pipes, such as XL pipe, shall not be used.
- C. All piping and fittings used for dry or anti-freeze systems shall be hot-dipped, galvanized.
- D. All equipment shall be U.L. listed and FM approved and installed in accordance with its listing and NFPA 13 requirements.

END OF SECTION 211313

SECTION 221100 - WATER DISTRIBUTION PIPING AND EQUIPMENT

1.1 SUMMARY:

- A. Water distribution piping system, including potable cold, hot, and recirculated hot water piping, fittings, and specialties within the building connecting to existing water piping in existing building and connecting to new equipment.
- B. Refer to applicable sections in 230000 for work relating to this section.

1.2 QUALITY ASSURANCE:

- A. Codes and Standards: Comply with applicable sections, follow recommended practices.
 - 1. State Boiler and Pressure Vessel Regulations
 - 2. ASME Codes for Boilers and Pressure Vessels
 - 3. International Plumbing Code with State Amendments
 - 4. International Mechanical Code with State Amendments
 - 5. International Building Code with State Amendments
 - 6. DFCM Design Standards
 - 7. HI Compliance: Design, manufacture, and install plumbing pumps in accordance with HI "Hydraulic Institute Standards".
 - 8. UL Compliance: Design, manufacture, and install plumbing pumps in accordance with UL 778 "Motor Operated Water Pumps".
 - 9. UL and NEMA Compliance: Provide electric motors and components which are listed and labeled by Underwriters Laboratories and comply with NEMA standards.

1.3 PIPE AND FITTINGS:

- A. Domestic Water Pipe: (except below slab/grade)
 - 1. Copper tubing. Conform to ASTM B88, Type L, hard temper, copper tube; ANSI B16.22 wrought-copper fittings, with soldered joints using 95-5 tin antimony solder or non-lead bearing solders.
 - 2. Galvanized pipe conforming to ASTM A53 schedule 40 with galvanized malleable iron screwed fittings.
- B. Domestic Water Pipe Below Slab/Grade:
 - 1. Copper Piping: ASTM B 88 (ASTM B 88M), Type "K", seamless water tube, annealed temper. Wrap piping with scotch wrap and then cover with 1/2" thick "Therma-cel" continuous. Set wrapped pipe in sand or pea gravel all around.

1.4 VALVES:

- A. Ball, butterfly, check, and drain valves are specified in Section 230523 - Valves.

1.5 PIPING SPECIALTIES:

- A. Water Hammer Arresters: (Piston type)

- B. Backflow Preventers

- 1. Reduced pressure principle. Comply with requirements of ASSE Standard 1013. Install line size.

- C. Strainers: Line size.

- 1. WWP 250 psi at 210°F, cast bronze body, threaded, solid retainer cap, 20 mesh stainless steel screen (except 3" to have 3/64" perforated screen).

- D. Pressure Reducing Valves: Select proper size for maximum flow rate and inlet and outlet pressures.

1.6 HOSE CONNECTIONS:

- A. Hose Bibb:

- 1. Fixture:

- a. Chrome plated brass, removable key, vacuum breaker, 3/4" inlet and outlet, provide isolation valve upstream of bibb.

- B. Non-Freeze Wall Hydrant:

- 1. Fixture:

- a. Bronze hydrant, exposed type removable key, vacuum breaker, automatic draining, stainless steel operating stem, rough brass finish.

1.7 DOMESTIC WATER HEATER:

- A. Gas-Fired Storage Type Water Heaters:

- 1. Description: Automatic, commercial, natural gas-fired; with vertical, ASME labeled, 150-psig-rated storage tank, gas burner, integral controls, draft diverter, drain valve, gas regulator, relief valve, fiberglass, insulation, steel jacket with baked-on enamel finish, glass-lined steel tank with anode rods and drain valve, adjustable thermostat, automatic gas shutoff device.

- 2. Vent:

- a. Type B UL listed double wall aluminum construction all in accordance with local gas company and applicable codes.

B. Electric Storage Type Water Heater:

1. Heavy duty medium watt density elements, Foam insulation, Non-simultaneous element operation, Glass lined tank with anodic protection, Three-year limited warranty, Temperature & Pressure relief valve, ASHRAE 90.1 compliant for thermal efficiency and standby losses. Install with heat traps of inlet and outlet.

1.8 DOMESTIC WATER EXPANSION TANKS:

- A. Factory built unit pressurized diaphragm type, ASME stamped. Steel tank with neoprene diaphragm and polypropylene liner for nonmetallic isolation of water from steel. NSF approved.
- B. Installation: Install complete. Provide shut-off valves to system and to drain.

1.9 DOMESTIC WATER CIRCULATING PUMPS:

- A. In-line, single stage, close coupled, mechanical seal, open type lubricable ball bearings, all bronze for domestic water service.

END OF SECTION 221100

SECTION 221400 - DRAINAGE AND VENT SYSTEMS AND EQUIPMENT

1.1 SUMMARY:

- A. Building sanitary and vent, storm drainage, including drains and drainage specialties, and sump pumps.

1.2 QUALITY ASSURANCE:

- A. Codes and Standards: Comply with applicable sections, follow recommended practices.
 1. State Boiler and Pressure Vessel Regulations
 2. ASME Codes for Boilers and Pressure Vessels
 3. International Plumbing Code with State Amendments
 4. International Mechanical Code with State Amendments
 5. International Building Code with State Amendments
 6. University of Utah Design Standards
 7. HI Compliance: Design, manufacture, and install plumbing pumps in accordance with HI "Hydraulic Institute Standards".
 8. UL Compliance: Design, manufacture, and install plumbing pumps in accordance with UL 778 "Motor Operated Water Pumps".
 9. UL and NEMA Compliance: Provide electric motors and components which are listed and labeled by Underwriters Laboratories and comply with NEMA standards.

1.3 WASTE, DRAIN AND VENT SYSTEMS:

- A. Sanitary Soil Drain, Waste and Vent Piping: (Below Grade)
 1. Piping: CISPI Standard 301, ASTM A-888 or ASTM A-74, cast iron soil pipe and fittings.
 2. Joints for Hubless Pipe: Hubless pipe and fittings joints shall conform to the requirements of ASTM Standard C-564 and Factory Mutual Standard 1680.
 3. Joints for Hub and Spigot Pipe: ASTM Standard C-564.
- B. Sanitary Soil Drain, Waste and Vent Piping: (Above Grade Only)
 1. Piping: CISPI Standard 301, ASTM A-888 or ASTM A-74, cast iron soil pipe and fittings.
 2. Joints for Hubless Pipe: CISPI Standard 310, ASTM Standard C-564 and local code requirements.
 3. Joints for Hub and Spigot Pipe: ASTM Standard C-564.

- 1.4 BUILDING STORM DRAINAGE SYSTEMS: (Water tight integrity is a must.)
- A. Verify roof drain body assembly with roof/deck configuration. Provide adapters, clamps, etc., as needed.
 - B. Storm Drainage Piping (Non Pressure Rated to 25 Ft. Hd.): (Below Grade)
 - 1. Piping: CISPI Standard 301, ASTM A-888 or ASTM A-74, cast iron soil pipe and fittings.
 - 2. Joints for Hubless Pipe: ASTM Standard C-564 and Factory Mutual Standard 1680.
 - 3. Joints for Hub and Spigot Pipe: ASTM Standard C-564.
 - C. Storm Drainage Piping (Non Pressure Rated to 25 Ft. Hd.): (Above Grade Only)
 - 1. Piping: CISPI Standard 301, ASTM A-888 or ASTM A-74, cast iron soil pipe and fittings.
 - 2. Joints for Hubless Pipe: CISPI Standard 310, ASTM Standard C-564 and local code requirements.
 - 3. Joints for Hub and Spigot Pipe: ASTM Standard C-564.
 - 4. Cleanouts as for waste piping.
 - D. Pumped Waste Piping: (Pressure rated above 25 feet of head)
 - 1. Class 50 ductile iron with gasketed grooved joint connections (ANSI/AWWA Standard C-606)
 - 2. Schedule 40, A-53, galvanized steel pipe, with galvanized malleable steel.
- 1.5 EQUIPMENT AND SYSTEM VENTS AND DRAINS:
- A. Piping:
 - 1. Piping on closed side of system to match primary system served.
 - 2. Open vent and drain piping of Schedule 40 galvanized steel or Type K or L copper.
 - B. Valves: Provide valves appropriate for duty.
 - 1. Locate air vent valves accessibly mounted on wall, 5'-0" above floor, extended to drain.
- 1.6 DRAINAGE PIPING SPECIALTIES:
- A. Provide complete condensate drain systems for all air handling units, etc., for all equipment which has a need for such service.
- 1.7 VENT FLASHING AND TERMINATION:

- A. Vent pipes penetrating the roof shall be flashed and made watertight at the roof.
- B. Vent pipes extending through the sidewall shall be made watertight at the wall penetration.

1.8 SUBMERSIBLE SUMP PUMPS:

- A. Extent of Work: Furnish and install duplex submersible sump pumps and fiberglass sump. Include pump, motor, controls, sump guide rails, lifting chain, quick couple pump connection.

END OF SECTION 221400

SECTION 224000 - PLUMBING FIXTURES

1.1 SUMMARY:

A. The types of fixtures specified includes the following:

1. Water Closets
2. Urinals
3. Lavatories
4. Work Sinks
5. Service Sinks
6. Hose Bibbs
7. Electric Water Cooler
8. Wall Hydrants
9. Cleanouts
10. Flush Valves
11. Fixture Supports
12. Faucets

1.2 QUALITY ASSURANCE:

A. Codes and Standards:

1. ANSI Standards A117.1: "Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People."
2. ADA: Americans with Disability Act.
3. International Plumbing Code.

1.3 ROUGH IN AND CONNECT

A. Rough in and connect to owner furnished equipment as required.

1.4 FIXTURES AND TRIM:

A. Water Closets:

1. Standard Use Fixture: Wall mounted, vitreous china, type with trim and accessories.
2. ADA Compliant Fixture: Wall mounted, vitreous china, type with trim and accessories. Mounted so top of seat is 18" above finished floor and with flush valve handle on accessible side to meet ADA requirements.

B. Urinals:

1. Standard Use Fixture: Wall mounted, vitreous china, type with trim and accessories.
2. ADA Compliant Fixture: Wall mounted, vitreous china, type with trim and accessories.

C. Lavatory: ADA Compliant Fixture, Vitreous china with trim and accessories.

D. Sinks:

1. Work Sink: Single compartment, counter mounted with trim and accessories
 2. Work Sink: Double compartment, counter mounted with trim and accessories.
- E. Service Sink: Wall mounted enameled cast iron with trim and accessories.
- F. Electric Water Cooler: (ADA Fixture) Wall-hung, bi-level with trim and accessories.
- G. Floor Drains: Nickel bronze strainer, cast iron body.
- H. Floor Sinks: White acid resisting porcelain enamel interior and top cast iron body and square slotted.
- I. Roof Drains: Cast iron body, aluminum or cast iron dome with locking screws.
- J. Downspout Nozzle: bronze body.
- K. Trim and Accessories: Water Closet Flush Valve: Standard and ADA Use Fixture, exposed type, chrome plated brass, closet flushometer.
1. Water Closet Seat: High impact plastic, open front, check hinge.
 2. Urinal Flush Valve: (Standard and ADA Fixture) Exposed, battery powered, automatic sensor type.
 3. Manual Lavatory Faucet: (Standard and ADA Fixture) Single lever handle, 4" center set.
 4. Sensor Operated Lavatory Faucet: (ADA Fixture) Battery powered, sensor operated electronic hand washing faucet.
 5. Lavatory Pre-formed Insulation and Protective Cover: (ADA Fixture) Pre-formed foam or fiberglass insulation with two piece white PVC snap on cover.
 6. Lavatory Supplies with Stops: Chrome plated cast brass angle stop, ball type.
 7. P-Trap: Tubular brass, chrome plated and chrome escutcheons.
 8. Lavatory Strainer: Drain with grid pattern strainer, cast brass, chrome plated.
 9. Work Sink Faucet: Underdeck mounted, 8" high rigid gooseneck spout.
 10. Service Sink Faucet: Wall-mounted mixing faucet.
 11. Strainer: Stainless steel, stainless steel basket.
 12. Service Sink P-Trap: Tubular brass, cleanout plug, chrome plated and chrome escutcheons.
 13. Carriers:

- a. Water Closet Carriers: Provide adjustable horizontal and/or vertical siphon jet rigid floor mounted carrier system.
- b. Urinal Carriers: Provide floor mounted carrier system.
- c. Electric Water Cooler: Provide floor mounted carrier system with adjustable top and bottom support plates.

END OF SECTION 224000

SECTION 230000 - GENERAL MECHANICAL REQUIREMENTS

1.1 SUMMARY: General Mechanical Requirements.

1.2 DESCRIPTION OF PROJECT: The mechanical work described in these mechanical specifications is for a project located in Draper, Utah. Design weather conditions are: 96° db, 62° wb, and winter 6°F. Altitude readings, unless otherwise noted, are for an elevation of 4,750 feet above sea level. Make adjustment to manufacturer's performance data as needed.

1.3 QUALITY ASSURANCE:

A. Perform the mechanical work in strict accordance with the applicable provisions of the various codes ordinances and adoptions pertaining to the project location in effect on the date of invitation for bids.

B. Perform the mechanical work in strict accordance with the Division of Facilities and Construction Management.

C. Reference Standards:

1. American Welding Society
2. International Mechanical Code/State Code
3. International Building Code/State Code
4. SMACNA Duct Design Standards
5. Local/State Plumbing Code
6. Locally enforced NFPA Codes
7. Local Fuel Utility Regulations
8. Local Power Utility Regulations
9. American Gas Association
10. ASME Codes for Pressure Vessels and Piping
11. ANSI B31.1 Piping

D. Manufacturer's Qualifications: Firm regularly engaged in manufacture of each specific piece of equipment, duct or system, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

E. Installer's Qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this project.

1.4 MECHANICAL INSTALLATIONS:

A. Coordinate mechanical equipment and materials installation with other building components.

1.5 ACCESSIBILITY:

A. Install equipment and materials to provide required access for servicing and maintenance.

1.6 CUTTING AND PATCHING:

A. Lay out the project where new work is involved ahead of time, providing sleeves and blockouts, and have work specifically formed, poured and framed to accommodate mechanical installations.

- 1.7 SUBMITTALS:
 - A. Submit shop drawings of all mechanical equipment, piping, controls, etc.
- 1.8 RECORD DRAWINGS:
 - A. Maintain a set of drawings, specifications, change orders, shop drawings, addenda, etc., for reference and upon which all deviations from the original layout are recorded.
- 1.9 OPERATION AND MAINTENANCE TRAINING:
 - A. Train the Owner on the function of all mechanical systems.
- 1.10 WARRANTY:
 - A. Special Warranty: Failure in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of substantial Completion.
- 1.11 CEILING SPACE COORDINATION:
 - A. Carefully coordinate ceiling cavity space with all trades.
- 1.12 SCHEDULING/METHODS OF PROCEDURE:
 - A. Schedule work in a timely manner.
- 1.13 QUALITY OF MATERIALS AND EQUIPMENT:
 - A. All equipment and materials shall be new, and shall be the standard products of manufacturers regularly engaged in the production of plumbing, heating, ventilating and air conditioning equipment, and shall be the manufacturer's latest design.
- 1.14 PROTECTION OF MATERIALS AND EQUIPMENT:
 - A. Close pipe and duct openings with caps or plugs to prevent lodgement of dirt or trash during the course of installation.
- 1.15 QUALIFICATIONS OF WORKMEN:
 - A. All mechanics shall be capable journeymen, skilled in the work assigned to them. Apprentices may be used with appropriate direction.
- 1.16 USE OF COMMON VENDORS: Do not burden the Owner with multiple brands of similar equipment unless so directed.
- 1.17 EXCAVATING AND BACKFILLING (GENERAL):
 - A. Provide all excavation, trenching and backfilling for Division 23 underground duct and piping work. Excavation and backfilling shall comply with applicable paragraphs of Division 2.

- 1.18 HANGERS AND SUPPORTS (GENERAL):
 - A. Provide hangers and/or supports for all equipment, piping and ductwork.
- 1.19 MANUFACTURER'S DIRECTIONS: Install all equipment in strict accordance with directions and recommendations furnished by the manufacturer.
- 1.20 LUBRICATION: Lubricate equipment at startup.
- 1.21 FLUSHING AND DRAINING OF SYSTEMS/CLEANING OF PIPING AND DUCTS: Fill, clean and flush and sterilize, all water piping systems with water and drain these systems before they are placed in operation.
- 1.22 JOBSITE CLEANUP:
 - A. Keep site clean during progress of work.
 - B. At the conclusion of work, clean all installation thoroughly.

END OF SECTION 230000

SECTION 230100 - OPERATION AND MAINTENANCE MANUALS

1.1 SUMMARY:

- A. Furnish bound operation and maintenance manuals. Manuals shall contain descriptive drawings and data which identify equipment installed at the project and detail the procedures and parts required to maintain and repair the equipment. Copies of approved submittals shall be included for all equipment.

1.2 BINDERS: Binders shall be a bar-lock type.

- A. Place the following information on the front cover and backbone:
 - 1. "Operation and Maintenance Manual".
 - 2. Project Name (and volume number if more than one volume).
 - 3. Project Number (eight digit DFCM number).
 - 4. Building name and number, and street address.
 - 5. Division of Facilities and Construction Management.
 - 6. Architect's name.
 - 7. Engineer's name.
 - 8. General Contractor's name.
 - 9. Mechanical Contractor's name.
 - 10. Items 6 through 9 need not be printed on the backbone.

1.3 CONTENTS AND INDEXING:

- A. The first section shall include the following information.
 - 1. Table of Contents and Name of project, DFCM project number, date awarded, date of substantial completion.
 - 2. Name, addresses and phone numbers of architects engineers and associates.
 - 3. Names addresses and phone numbers of contractors and subcontractors and sub-contractors and the work to which each was assigned.
 - 4. An equipment list with the names, addresses and phone numbers of suppliers. Each piece of equipment shall be described by name, identification number, location, and function.
- B. The second section shall include the following information.
 - 1. Operating systems description to describe operating modes with single-line diagrams; all setpoints and normal operating parameters for all load, pressure temperature and flow checkpoints; all alarms and cautions for operations.
 - 2. Schematic control diagrams of all mechanical systems.
- C. The third section shall include the following information.
 - 1. A comprehensive lubrication and maintenance schedule for all the equipment.
- D. The fourth section shall include the following information.

1. Test run and balancing reports with drawings.
- E. In following sections, devote each section to an individual piece of equipment complete with operation and maintenance data for that equipment.

END OF SECTION 230100

SECTION 230513 - MOTORS, DRIVES AND ELECTRICAL REQUIREMENTS FOR MECHANICAL WORK

1.1 SUMMARY:

- A. Requirements for motors and drives and electrical components which are an integral part of packaged mechanical equipment.

1.2 QUALITY ASSURANCE:

- A. Provide electrical components and materials which are UL labeled.
- B. NEMA Standards MG 1: Motors and Generators.
- C. NEMA Standards ICS 2: Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA Standards 250: Enclosures for Electrical Equipment.
- E. NEMA Standards KS 1: Enclosed Switches.
- F. Comply with National Electrical Code (NFPA 70).

1.3 MOTORS:

- A. The following are basic requirements for motors.
 - 1. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads. Design B motors for most applications, design C where recommended by the equipment manufacturer.
 - 2. Size motors large enough so that the driven load will not require the motor to operate in the service factor range.
 - 3. Constant Speed Motors: Induction motors shall be TEFC or ODP type depending on operating environment.
 - 4. Variable Speed Motors: Motors operated by variable frequency drives shall be "Premium Efficiency Inverter Rated" squirrel cage induction motors.
 - 5. Noise Rating: "Quiet"
 - 6. Nameplate: indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

1.4 MOTOR DRIVES:

- A. Provide coupled drives as required.

END OF SECTION 230513

SECTION 230523 - VALVES

1.1 SUMMARY:

- A. Types of valves:
 - 1. Ball Valves.
 - 2. Butterfly Valves.
 - 3. Swing Check.
 - 4. Miscellaneous Valves.

1.2 QUALITY ASSURANCE:

- A. Valve Types: Provide valves of same type by same manufacturer.
- B. Valve Identification: Provide valves with manufacturer's name (or trademark) and pressure rating clearly marked on valve body.
- C. Codes and Standards:
 - 1. MSS Compliance: MSS-25 "Standard Marking System for Valves, Fittings, Flanges and Unions".
 - 2. ANSI Compliance: ANSI B16.10 "Face-to-Face and End-to-End Dimensions of Ferrous Valves".
 - 3. UL and FM Compliance: Provide valves used in fire protection piping, which are UL-listed and FM approved.

1.3 VALVES:

- A. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated.

1.4 DOMESTIC COLD WATER, DOMESTIC HOT WATER, AND DOMESTIC HOT WATER RETURN (COPPER PIPE):

- A. Ball Valves: Construction and ratings to meet duty.
- B. Butterfly Valves: Construction and ratings to meet duty.
- C. Swing Check Valves: Construction and ratings to meet duty.

1.5 MISCELLANEOUS VALVES AND SPECIALTIES:

- A. Air Vent Valves: Construction and ratings to meet duty.
- B. Water Pressure Reducing Valves: Construction and ratings to meet duty.
- C. Water Pressure Relief Valves: Construction and ratings to meet duty.
- D. Gauge Valves: Construction and ratings to meet duty.

END OF SECTION 230523

SECTION 230529 - MECHANICAL SUPPORTING DEVICES

1.1 SUMMARY:

- A. Types of supports and anchors specified in this section include the following:
 - 1. Horizontal-Piping Hangers and Supports.
 - 2. Vertical-Piping Clamps.
 - 3. Hanger-Rod Attachments.
 - 4. Building Attachments and In-Beds.
 - 5. Saddles and Shields.
 - 6. Miscellaneous Materials.
 - 7. Roof Equipment Supports.
 - 8. Anchors.
 - 9. Equipment Supports.

1.2 QUALITY ASSURANCE:

- A. Codes and Standards:
 - 1. Code Compliance: Comply with applicable building, mechanical and plumbing codes pertaining to product materials and installation of supports and anchors.
 - 2. UL and FM Compliance: Provide products which are UL-listed and FM approved.

1.3 HORIZONTAL-PIPING HANGERS AND SUPPORTS:

- A. General: Provide factory- fabricated horizontal piping hangers and supports complying with MSS Standards.

1.4 VERTICAL-PIPING CLAMPS:

- A. General: Provide factory- fabricated vertical-piping clamps complying with MSS Standards.

1.5 HANGER-ROD ATTACHMENTS:

- A. General: Provide factory- fabricated hanger-rod attachments complying with MSS Standards.

1.6 BUILDING ATTACHMENTS AND IN-BEDS:

- A. General: Provide factory- fabricated building attachments complying with MSS Standards.

1.7 SADDLES AND SHIELDS:

- A. General: Provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

1.8 HIGH HUMIDITY AREAS: Use cadmium plated or galvanized hangers, attachments, rods, nuts, bolts and other accessories in boiler rooms or other high humidity areas.

1.9 OUTSIDE AREAS: Use galvanized hangers, attachments, rods, nuts, bolts and other accessories for all outside areas.

END OF SECTION 230529

SECTION 230548 - MECHANICAL SOUND, VIBRATION AND SEISMIC CONTROL

1.1 SUMMARY: Furnish and install complete seismic restraint and vibration control systems for all work installed under Division 23. Work to be responsive to the intent of the International Building Code, latest adopted edition, for the respective site classification, seismic use group and component importance factors:

- A. Site Classification: Class D
- B. Category 3
- C. Importance Factor: 1.25
- D. All subject to actual building soil report

1.2 QUALITY ASSURANCE:

- A. Manufacturer=s Qualifications: Engage the services of an independent seismic and vibration control subcontractor who has the technology, experience, computer capabilities and manufactured products to prepare the required computations, shop drawings and special devices to provide complete seismic and vibration control.

1.3 REFERENCES:

- A. Codes and Standards: (Latest adopted edition)
 - 1. International Building Code
 - 2. NFPA bulletin 90A,
 - 3. UL Standard 181

 - 4. Guidelines for seismic restraint of Mechanical Systems and Plumbing Piping Systems. Published by the Sheet Metal Industry Fund of Los Angeles, California, and the Plumbing and Piping Industry Council, Inc., Los Angeles, California.

1.4 MATERIALS - PRODUCTS: Restraint devices shall be especially designed to resist seismic forces in all directions.

END OF SECTION 230548

SECTION 230553 - MECHANICAL IDENTIFICATION

1.1 SUMMARY:

- A. All plumbing, heating, air conditioning, automatic temperature control equipment (excluding thermostats and relays), and distribution systems shall be labeled. Include all fire damper, fire/smoke damper and smoke dampers. Electrical switches and starters for mechanical equipment shall also be labeled.

1.2 EQUIPMENT, VALVE PIPE AND DUCT IDENTIFICATION:

A. Equipment Identification:

- 1. Identify all equipment including, but not limited to, all mechanical equipment, ATC panels including individual gauges and meters, ATC controllers, etc. Devices shall be identified with signs made of laminated plastic with large engraved letters. (white letters on black background)

B. Valve Tagging:

- 1. All valves shall be designated by distinguishing numbers and letters on required charts and diagrams. Furnish and install approved brass tags identifying number, duty, position, with numbers and letters on the tags corresponding to those on the charts and diagrams.
- 2. Valve Identification:
 - a. All valves, regardless of size, shall have brass tags which engraved lettering. Each valve on the drawing shall be identified separately, and valve tags shall match the drawing identification.

C. Ductwork and Piping Identification:

- 1. All accessible ductwork and piping, including that above lay in ceilings, shall be color coded and identified with wording and arrows every 50 feet, at each riser, at each junction, adjacent to each valve or terminal device, and where required to easily identify the medium transported.
- 2. Identify all fire and fire/smoke dampers, stencil designation on damper access doors.
- 3. Arrows to indicate direction of flow shall be painted on ductwork.

1.3 PANEL IDENTIFICATION:

- A. All panel devices shall have engraved black face formica with white engraved lettering labels on panel faces.
- B. All panel wiring and tubing shall be numerically or alphabetically coded.

END OF SECTION 230553

SECTION 230593 - SYSTEM COMMISSIONING, TESTING AND BALANCING

- 1.1 SYSTEM COMMISSIONING - EXTENT OF WORK: Provide complete system commissioning of all equipment on air systems, and specialty systems.
- 1.2 TESTING AND BALANCING - EXTENT OF WORK: Provide complete testing, adjusting and balancing of all air systems, and specialty systems.
- 1.3 PRE-STARTUP INSPECTION:
 - A. The pre-startup inspection of all systems shall provide for verifying that each piece of equipment is properly installed and prepared for startup.
- 1.4 FIRST RUN INSPECTION:
 - A. Recheck all items to insure proper operation.
 - B. Check the following items:
 - 1. Excessive vibration or noise.
 - 2. Loose components.
 - 3. Initial control settings.
 - 4. Motor amperages.
 - 5. Heat buildup in motors, bearings, etc.
 - 6. Control system is properly calibrated and functioning as required.
 - C. Correct all items which are not operating properly.
- 1.5 SYSTEM OPERATION INSPECTION:
 - A. Observe mechanical systems under operating conditions for sufficient time to insure proper operation under varying conditions, such as day-night and heating-cooling.

END OF SECTION 230593

SECTION 230700 - MECHANICAL INSULATION

1.1 SUMMARY:

- A. Extent of mechanical insulation required by the current Model Energy Code, Division of Facilities and Construction Management and by requirements of this section. Use no asbestos in this work.
- B. Types of mechanical insulation specified in this section include the following:
 - 1. Piping Systems Insulation:
 - a. Fiberglass.
 - b. Flexible Unicellular.
 - 2. Ductwork System Insulation:
 - a. Fiberglass.
 - b. Rigid flexible wrap.
 - c. Fireproofing for grease laden exhaust ductwork.
 - 3. Equipment Insulation:
 - a. Fiberglass.
 - b. Cellular Glass.
 - c. Flexible Unicellular.

1.2 QUALITY ASSURANCE:

- A. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.

1.3 PIPING INSULATION MATERIALS:

- A. Meet all ASTM requirements and include as a minimum insulation, jacketing, adhesive, sealers, shield, etc.
 - 1. Preformed Fiberglass Piping Insulation: ASTM C 547.
 - 2. Cellular Glass Piping Insulation: ASTM C 552.
 - 3. Jackets for Piping Insulation:

1.4 DUCTWORK INSULATION MATERIALS:

- A. Meet all ASTM requirements and include as a minimum insulation, jacketing, adhesive, cement, coatings, etc.
 - 1. Rigid Fiberglass Ductwork Insulation: ASTM C 612.
 - 2. Flexible Fiberglass Ductwork Insulation: ASTM C 553.
 - 3. Calcium Silicate Duct Insulation: ASTM C553.
- B. Jackets for Ductwork Insulation: ASTM C 921.

1.5 EQUIPMENT INSULATION MATERIALS:

- A. Meet all ASTM requirements and include as a minimum insulation, jacketing, adhesive, cement, coating, etc.
 - 1. Rigid Fiberglass Equipment Insulation: ASTM C 612.
 - 2. Flexible Fiberglass Equipment Insulation: ASTM C 553.
 - 3. Flexible Unicellular Sheet Insulation: ASTM C 534.

1.6 PIPE JACKETING:

- A. Provide and install jacketing for all exposed insulated pipe.
 - 1. Domestic water other insulated piping.
 - a. PVC sheets
 - b. PVC formed fitting covers.
 - c. Solvent welded joints and seams.
(Provide for removal and expansion.)
- B. All joints and seams caulked and sealed water tight.

1.7 FIRE/SMOKE ENCASEMENT:

- A. Any and all PVC, PVDF, polypropylene, acid waste and vent and any other plastic piping located in return air plenums shall be encased in rated flame and smoke system. The enclosure shall meet all codes.

1.8 GENERAL:

- A. Piping insulation shall be fiberglass one-piece preformed pipe insulation, class related to temperature, with all purpose (ASJ) fire retardant jacket, additional jacketing as noted.
- B. Fittings and valves shall be insulated and covered with PVC covers.
- C. All cold water, chilled water, roof drains or any other lines shall have a vapor-proof jacket.
- D. Fire and smoke hazard for a complete insulation system shall not exceed:
 - 1. Flame spread - 25
 - 2. Fuel contribution - 50
 - 3. Smoke development - 50
- E. Hangers shall not contact pipe where pipe is specified to be insulated. Insulation shall run continuous through the pipe hanger.

END OF SECTION 230700

SECTION 230900 - MECHANICAL CONTROL SYSTEMS

1.1 SUMMARY:

- A. Provide a complete functioning control system for all mechanical systems.

1.2 QUALITY ASSURANCE:

A. CODES AND STANDARDS:

1. Electrical Standards: Provide electrical products which have been tested, listed and labeled by UL and comply with NEMA standards.
2. NEMA Compliance: Comply with NEMA standards pertaining to components and devices for electric control systems.
3. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.
4. Comply with NFPA 70, "National Electric Code" for all electrical installation.

1.3 CLEANING AND LUBRICATION: All instruments and control panels shall be thoroughly cleaned before final acceptance.

1.4 TESTING AND ADJUSTING OF SYSTEM:

- A. During the system commissioning, testing and balancing of the various building systems, have a controls representative(s) present and available to interpret and adjust controls as needed. Demonstrate and report the integrity and accuracy of each function and control point.

1.5 CONTROL CABINETS: Furnish stamped steel with hinged door and locking latch control cabinets to protect and conceal all control devices. Arrange components neatly to provide adequate maintenance opportunity and proper device function. Label all components, numerically code all piping and wiring. Terminate all wiring at terminal blocks. Provide engraved plastic labels for all panel face devices.

1.6 DAMPERS:

- A. Provide damper operators with diaphragms or motors of proper size, so that the motors will operate against the static pressure of the systems. Provide each damper motor with a bracket for attaching to ductwork, building structure or equivalent. Damper motors in plenums shall be mounted on damper frames. Do not install motors in ducts. Modulating motors where indicated shall be provided with integral stops for both minimum and maximum stop.

1.7 COMMUNICATIONS CONDUCTORS:

- A. Connect each and every sensor back to the Direct Digital master controller in its respective rooftop unit with required conductors. All in accordance with National Electric Code, conductors in conduit (3/4" minimum).

1.8 CONTROL WIRING:

- A. In concealed locations above lay-in ceilings low voltage conductor may be installed without conduit. Low voltage conductor shall be UL listed Article 725 Plenum Cable. Install the cable parallel to building walls.
- B. In all exposed areas, above hard ceilings, within walls, etc., all control wiring shall be installed in conduit per National Electric Code. Installation shall be square with the walls of the buildings.
- C. Number and code all wiring.

- 1.9 SPACE SENSOR (ROOM THERMOSTAT):
 - A. Provide as part of rooftop unit control system.
- 2.0 TIME CLOCK: Electric seven day clock for exhaust fans.
- 2.1 SMOKE DETECTORS: For installation in all fan systems above 2,000 cfm.
- 2.2 FREEZESTATS: Manual reset, non-averaging, extended capillary tubes type.
- 2.3 FIRESTATS, HI-LIMIT THERMOSTAT: Manual reset, break on rise for protection, make on rise for alarm with relay needed to make on rise.

END OF SECTION 230900

SECTION 231123 - NATURAL GAS PIPING

PART I - GENERAL

1.01 DESCRIPTION OF WORK:

- A. Provide and install complete natural gas systems.
- B. Trenching and backfill required in conjunction with gas service piping is specified in applicable Division-23 sections, and is included as work of this section.

1.02 QUALITY ASSURANCE:

- A. CODES AND STANDARDS: Comply with applicable sections, follow recommended practices.
 - 1. NFPA
 - 2. Local gas company.
 - 3. "International Fuel Gas Code".

1.03 BASIC IDENTIFICATION:

- A. Building Distribution Piping: Plastic pipe markers.
- B. Gas Service: Underground-type plastic line markers.
- C. Gas Valves: Plastic valve tags.

1.04 PIPING AND PIPE FITTINGS:

- A. UNDERGROUND GAS SERVICE PIPING:
 - 1. Black steel pipe; Schedule 40; wrought-steel butt welding fittings.
 - 2. Wrapping: Machine wrap pipe using 50% overlap wrap, with polyvinyl chloride tape. Hand wrap fittings using 100% overlap wrap extending 6" beyond fitting onto wrapped pipe. Comply with tape manufacturer's installation instructions.
 - 3. Pipe Sizes 1/2" Through 6": Thermoplastic gas pressure pipe, tubing, and fittings complying with ASTM D 2513.
- B. BUILDING DISTRIBUTION PIPING:
 - 1. Pipe Size 2" and Smaller: Black steel pipe; Schedule 40; malleable-iron threaded fittings (exposed), welded fittings and joints (concealed).
 - 2. Pipe Size 2-1/2" and Larger: Black steel pipe; Schedule 40; wrought-steel butt welding fittings.

1.05 VALVES:

- A. GENERAL: Provide and install valves required for natural gas systems.

- a. Gas Cocks 2" and Smaller: 150 psi non-shock WOG, bronze straightway cock, flat or square head, threaded ends.
- b. Gas Cocks 2-1/2" and Larger: 125 psi non-shock WOG, iron body bronze mounted, straightway cock, square head, flanged ends.

1.06 PRESSURE REGULATING VALVES:

- A. GENERAL: Provide single stage, steel jacketed, corrosion- resistant gas pressure regulators; with atmospheric vent, elevation compensator; with threaded ends for 2" and smaller, flanged ends for 2-1/2" and larger; for inlet and outlet gas pressures, specific gravity, and volume flow indicated.

- 1.07 GAS METER: By Local Gas Company. Contractor to coordinate and pay all associated fees with gas meter set and supply line to the buildings.

END OF SECTION 231123

SECTION 233100 - DUCTWORK

1.1 SUMMARY:

- A. Ductwork shall be constructed of galvanized sheet metal.
- B. Types of ductwork required for the project include the following:
 - 1. Round
 - 2. Rectangular
 - 3. Oval
 - 4. Spiral
 - 5. Factory
 - 6. Factory duct

1.2 QUALITY ASSURANCE:

- A. Codes and Standards:
 - 1. SMACNA Standards: Comply with SMACNA "HVAC Duct Construction Standards, Metal and Flexible" for fabrication and installation of metal ductwork.
 - 2. ASHRAE Standards: Comply with ASHRAE Handbook, Equipment Volume, Chapter 1 "Duct Construction", for fabrication and installation of metal ductwork.
 - 3. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air-Conditioning and Ventilating Systems" and NFPA 90B "Standard for the Installation of Warm Air Heating and Air-Conditioning Systems".
 - 4. Uniform Building Code/Uniform Mechanical Code: Comply with all sections pertaining to mechanical work.
- B. Field Reference Manual: Have available for reference at project field office, copy of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".

1.3 DUCTWORK - GENERAL:

- A. Standards: All duct fabrications shall comply with standards and techniques detailed by SMACNA "Duct Construction Manuals" for the appropriate pressure class, and with the ASHRAE
- B. Sheet Metal: Fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lockforming quality, with G 90 zinc coating in accordance with ASTM A 525; mill phosphatized for exposed locations.

1.4 FITTINGS AND FABRICATION:

- A. Fittings: Provide radius type fittings fabricated of multiple sections with maximum 15° change of direction per section. Use 45° lateral and 45° elbows for branch take-off connections. Where 90° branches are indicated, provide conical type tees.

1.5 DUCT PRESSURE CLASSIFICATIONS:

- A. For constant volume low pressure air handling systems.
 - 1. Rectangular supply air and return air ductwork: Low pressure rectangular ductwork, 3" w.g.
 - 2. Round supply air ductwork, exposed to view: Spiral lockseam, 3" w.g.
 - 3. Rectangular supply air and return air ductwork: Low pressure rectangular ductwork, 3" w.g.
 - 4. Branch round supply air ductwork runout from rectangular ductwork to diffuser: Low pressure round ductwork, 1" w.g.
- B. Low pressure exhaust ductwork systems, which include but are not necessarily limited to:
 - 1. Low pressure rectangular ductwork, 3" w.g. Increase metal gauge by 2 (i.e., 20 to 18) for all sizes.

1.6 FACTORY DUCT:

- A. Extent of Work: Provide factory duct at connections to air terminal units, at runouts to grilles and diffusers, at points of round to round flexible connections (see also "Flexible Connections") and at other locations indicated or required.
- B. Prohibited Material: Do not use single wire helix ducting with vinyl or plastic liner of any type.
- C. Installation: Follow manufacturers instructions. Use stainless steel or nylon band clamping rings. In general, do not use lengths in excess of 3 feet. Make bends only in long radius format. Support duct to avoid droops and kinks.

1.7 MISCELLANEOUS DUCTWORK MATERIALS:

- A. Duct Sealing Compound: Seal all duct air tight to tighten pressure clamp.
- B. Acoustical Lining: Ductwork may be acoustically lined in lieu of external insulation.
- C. Duct Liner Adhesive: Comply with ASTM C 916 "Specifications for Adhesives and Duct Thermal Insulation".
- D. Duct Liner Fasteners: Comply with SMACNA HVAC Duct Construction Standards, Article S2.11.

END OF SECTION 233100

SECTION 233300 - DUCTWORK ACCESSORIES

1.1 SUMMARY:

- A. Types of ductwork accessories required for project include the following:
 - 1. Dampers.
 - a. Low pressure manual dampers.
 - b. Control dampers.
 - 2. Fire and smoke dampers.
 - 3. Turning vanes.
 - 4. Duct hardware.
 - 5. Duct access doors.
 - 6. Flexible connections.
 - 7. Sound Traps
- B. Refer to other Division-23 sections for testing, adjusting, and balancing of ductwork accessories; not work of this section.

1.2 QUALITY ASSURANCE:

- A. Codes and Standards:
 - 1. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".
 - 2. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.
 - 3. UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers".
 - 4. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of ductwork accessories.

1.3 DAMPERS:

- A. Material: Opposed blades are round with locking guard.
- B. Control dampers: Low leakage type with spring loaded side seals, inflatable butyl or neoprene fabric edge seals, bronze or teflon bearings.

1.4 COMBINATION FIRE/SMOKE DAMPERS:

- A. UL listed and labeled damper.

1.5 DUCT HARDWARE:

- A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:
 - 1. Test Holes: Provide in ductwork at fan inlet and outlet.

- 2. Quadrant Locks: Provide for each damper.
- 1.6 DUCT ACCESS DOORS: Doors shall be 2" narrower than the duct width by 18" up to a maximum of 24" x 18".
- 1.7 FLEXIBLE CONNECTIONS:
 - A. Extent of Work: Provide flexible connections between ductwork or plenums and equipment, such as at fan inlets and discharges, and at other places indicated on the drawings or called for by note or specification.
- 1.8 SOUND TRAPS:
 - A. Sound Traps: (Use on power return/relief or relief only units.)
 - B. Material: Steel shell, perforated steel partitions, packed mineral or fiberglass filter material.
 - C. Installation: Sleeve wall openings, seal all around with angle iron closure. Follow with 2" of rigid insulation all around sound traps, butted tight to angle closure. Cover with canvas and seal.

END OF SECTION 233300

SECTION 233423 - POWER VENTILATORS

1.1 SUMMARY:

- A. Types of power and gravity ventilators specified in this section include the following:
 - 1. Power ventilators.
 - a. Rooftop Exhaust Fans
 - b. Ceiling Exhaust Fans

1.2 QUALITY ASSURANCE:

- A. Codes and Standards:
 - 1. AMCA Compliance: Provide power ventilators which have been tested and rated in accordance with AMCA standards, and bear AMCA Certified Rating Seal.
 - 2. UL Compliance: Provide power ventilators which are listed by UL and have UL label affixed.
 - 3. NEMA Compliance: Provide motors and electrical accessories complying with NEMA standards.

1.3 ROOFTOP EXHAUST FANS:

- A. GENERAL: Furnish and install roof mounted spun aluminum dome type exhaust fans, of size and capacity scheduled on the drawings. Fan shall be a single width, single inlet, airfoil steel wheel, belt driven centrifugal vent set. Fan shall be listed by Underwriters Laboratories (UL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.

1.4 CEILING EXHAUST FANS:

- A. Ceiling mounted fans shall have acoustically insulated housings. Fans shall bear the AMCA seal and the UL label. Integral backdraft damper centrifugal wheels, ceiling grille.

END OF SECTION 233423

SECTION 233713 - AIR OUTLETS AND INLETS

1.1 SUMMARY:

A. Types of outlets and inlets required for project include the following:

1. Ceiling air diffusers and grilles.
2. Wall registers and grilles.
3. Louvers.

1.2 QUALITY ASSURANCE:

A. Codes and Standards:

1. ARI Compliance: Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets".
2. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".
3. AMCA Compliance: Test and rate louvers in accordance with AMCA 500 "Test Method for Louvers, Dampers and Shutters".
4. AMCA Seal: Provide louvers bearing AMCA Certified Rating Seal.
5. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

1.3 GRILLES AND DIFFUSERS:

- A. General: Except as otherwise indicated, provide manufacturer's standard grilles, registers and diffusers; of size, shape, capacity and type required; constructed of materials and components as indicated, and as required for complete installation.
- B. Volume Control Dampers: Provide duct mounted dampers of the externally adjustable opposed blade type where more than one grille or register is on a common duct. Provide access to each damper adjustment.
- C. Sound Level: The diffuser or grille generated noise shall not exceed the following sound power level curve at a point five feet away from the diffuser or grille.
1. Meeting Rooms: Classrooms: NC 25-30
 2. Study: NC 25-30
 3. Office Areas: NC 25-30
 4. Work Rooms: NC30-35
 5. Storage: NC35

1.4 LOUVERS:

- A. Extent of Work: At air openings in the outside wall where indicated on drawings, install AMCA rated drainable stationary extruded aluminum 4" or 6" deep weather louvers.

- B. Contractor must coordinate louver size, flange type, and construction with structural and architectural openings to assure fit and appearance. Louvers shall be one piece.

END OF SECTION 233713

SECTION 234116 - AIR FILTERS

1.1 SUMMARY:

- A. Types of air cleaning equipment specified in this section include the following:
 - 1. Air Filters.
 - a. Replaceable (throwaway).
 - 2. Filter Gages.
- B. Filters for packaged rooftop units are work of this section.

1.2 QUALITY ASSURANCE:

- A. Codes and Standards:
 - 1. UL Compliance: Comply with UL Standards pertaining to safety performance of air filter units.
 - 2. ASHRAE Compliance: Comply with provisions of ASHRAE Standard 52 for method of testing, and for recording and calculating air flow rates.
 - 3. ARI Compliance: Comply with provisions of ARI Standard 850 pertaining to test and performance of air filter units.

1.3 AIR FILTERS:

- A. Type 1: Replaceable pleated media type filters.
 - 1. Pleated, medium efficiency in a cardboard holding frame, 0.32" s.p. maximum initial pressure drop at 500 feet/minute, to change out at 0.50". U.L. Class 2, 25-30% efficiency, 90-95% arrestance per ASHRAE Standard 52-76.
- B. Filter Gauges:
 - 1. Inclined tube manometer, oil filled type.
 - 2. Furnish with mounting bracket, pressure tips, tubing vent/zero valves.
- C. Startup Set:
 - 1. Install a set of Type 2 filters immediately upon fabrication of any filter bank. Install scheduled set of filters at completion of construction at the time of testing and balancing.

END OF SECTION 234116

SECTION 237400 - PACKAGED ROOFTOP AIR CONDITIONING UNITS

PART 1 - GENERAL

1.01 SUMMARY:

- A. the Types of packaged air-conditioning units specified in this section include the following:
1. Single Zone Rooftop units. (Electric Cooling, Gas Heating and Ventilating)

1.01 QUALITY ASSURANCE:

- A. Codes and Standards:
1. AMCA Compliance: Test and rate air handling units in accordance with AMCA standards.
 2. ARI Compliance: Test and rate air handling units in accordance with ARI, display certification symbol on units of certified models.
 3. ASHRAE Compliance: Construct and install refrigerant coils in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".
 4. NFPA Compliance: Provide air handling unit internal insulation having flame spread rating not over 25 and smoke developed rating no higher than 50; and complying with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".
 5. NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to installation and electrical connections of ancillary electrical components of air handling units.
 6. International Building Code/International Mechanical Code: Comply with all sections pertaining to mechanical work.

1.02 PACKAGED SINGLE ZONE ROOFTOP UNITS:

- A. Description: Factory assembled and tested; designed for outdoor roof installation; and consisting of supply fans, return/relief fans or relief fans (larger than 5 tons) compressors, condensers, evaporator coils, condenser and evaporator fans, refrigeration and temperature controls, gas heater, filters and dampers.
- B. Construction:
1. Cabinet shall be constructed entirely of G90 galvanized steel with the exterior constructed of 20 gauge or heavier material.
 2. Paint finish shall be capable of withstanding at least 2000 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
 3. Access to filters, blower, heating section, and other items shall be through stainless steel hinged gasketed access doors with quarter turn latches.

- C. Supply fans:
- 5 tons and smaller:
1. Blower shall be a direct drive plenum fan with airfoil blades.
 2. Blower and motor shall be dynamically balanced.
 3. The motor shall be furnished with two speeds for capacity and humidity control.
 4. The motor shall have permanently lubricated ball bearings and built-in thermal overload protection.
- Larger than 5 tons:
1. Blower(s) shall be entirely self contained on a slide deck for service and removal from the cabinet.
 2. All belt drive blower(s) shall have backward inclined airfoil blades.
 3. Adjustable V-belt drive shall be provided with a minimum rating of 140% of the motor nameplate brake horsepower when the adjustable pulley is at the minimum RPM.
 4. Blowers, drives and motors shall be dynamically balanced.
- D. Power Return/Relief or Relief Only:
1. Direct or Belt driver, air fail fans, motorized low leak gasketed motorized dampers.
- E. Outside Air:
1. Shall be fully modulating, dry bulb controlled economizer with multistage integrated economizer and compressor operation. Motor operated outdoor air damper and return air damper assembly constructed of extruded aluminum, hollow core, air foil blades with rubber edge seals and aluminum end seals, Damper motor shall be spring return.
- F. Condenser:
1. Air Cooled Condenser Section:
 - a. The condensing section shall be equipped with vertical discharge axial flow direct drive fans and condenser coils copper tubes and aluminum fins.
- G. Filters: 2" thick fiberglass, throwaway with an ASHRAE efficiency of 30%. See Section 234116.
- H. Evaporator Coils:
1. Copper tube with aluminum fins, galvanized steel end casings, equalized type vertical tube headers, thermostatic expansion valve and 304 stainless steel double sloped drain pan.
- I. Refrigeration System:
1. Scroll type compressors with internal thermal overload protection independent refrigerant circuits, single stage on 5 ton or smaller multistage capacity control on larger than 5 ton, automatic reset low pressure and manual reset high pressure refrigerant controls, refrigerant liquid line driers, liquid line sight glasses, 5 minute anti-short cycle delay timer for each stage, suction and discharge service valves, low ambient control to zero degrees, unit shall operate on R-410A refrigerant.

J. Gas Heat Section:

1. 5 Tons and Smaller

Gas heating furnace consisting of an aluminized steel heat exchanger, induced draft blower, electric pressure switch, drum type heat exchangers, with a 15 year non pro-rated warranty.

2. Larger than 5 Tons

Natural gas full modulating adjustable speed combustion blower and stainless steel tubular heat exchanger, discharge air sensor, electronic controller.

K. Controls:

1. Direct Digital programmable controllers, control circuit board with LED's, minimum outside air control, labeled terminal strips, switches, relays, sensor, limits, safeties, etc..

L. Smoke Detector:

1. Provide smoke detectors on 2000 cfm and larger units.

M. Power:

1. Provided with phase and brown-out protection, 115 volt, 15 amp ground fault service receptacle.

2.2 ROOF CURBS

- A. Galvanized steel, fully gasketed, cross structure support.

END OF SECTION 237400

SECTION 238200 - TERMINAL HEAT TRANSFER UNITS

1.1 SUMMARY:

A. Types of terminal units required for project include the following:

1. Cabinet heaters, electric.
2. Unit heaters, electric.

1.2 CABINET HEATERS: (Electric)

A. General: Provide electric cabinet heaters having cabinet sizes and in locations as indicated, and of capacities, style, and having accessories as scheduled. Include in basic unit chassis, electric elements, fan board, fan wheels, housings, filter rails, motor, electric junction box and insulation.

1.3 UNIT HEATERS: (Electric)

A. General: Provide electric unit heaters in locations as indicated, and of capacities, and style and having accessories as scheduled.

END OF SECTION 238200

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

1.1 SUMMARY

- A. Electrical equipment coordination, sleeves and sleeve seals for raceways and cables, and common electrical installation requirements.

1.2 MATERIALS

- A. Sleeves for Raceways and Cables:
 - 1. Steel pipe sleeves.
 - 2. Cast-iron pipe sleeves.
 - 3. Sleeves for rectangular openings.
- B. Sleeve Seals: Modular sealing devices with EPDM sealing elements, plastic, pressure plates, and carbon or -steel connecting bolts and nuts.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

1.1 SUMMARY

- A. Building wires, cables, connectors, splices, and terminations for wiring systems rated 600 V and less; and sleeves and sleeve seals for cables.

1.2 QUALITY ASSURANCE

- A. Quality Standard: NFPA 70.

1.3 MATERIALS

- A. Conductors and Cables:

- 1. Conductors: Copper.
- 2. Conductor Insulation: Types XHHW-2, THHN-THWN-2.

- B. Connectors and Splices: Factory fabricated.

- C. Sleeves for Raceways and Cables:

- 1. Steel pipe sleeves.
- 2. Cast-iron pipe sleeves.
- 3. Sleeves for rectangular openings.

- D. Sleeve Seals: EPDM sealing elements, plastic pressure plates, and carbon-steel connecting bolts and nuts.

1.4 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper, stranded for all sizes.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

1.5 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Feeders: Type THHN-THWN-2, single conductors in raceway.
- C. Branch Circuits: Type THHN-THWN-2, single conductors in raceway.

- D. Branch Circuits Installed below Computer Room Raised Flooring: Type THHN-THWN-2, single conductors in liquid-tight flexible metal conduit.
- E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- F. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- G. Class 2 Control Circuits: Type THHN-THWN, in raceway.

1.6 FIELD QUALITY CONTROL

- A. Testing: By Contractor.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

1.1 SUMMARY

- A. Methods and materials for grounding electrical systems and equipment.

1.2 QUALITY ASSURANCE

- A. Quality Standard for Grounding Materials and Equipment: UL 467.

1.3 PRODUCTS

- A. Insulated Conductors: Copper or tinned-copper wire and cable.
- B. Bare Copper Conductors:
 - 1. Solid conductors.
 - 2. Stranded conductors.
 - 3. Tinned conductors.
 - 4. Stranded bonding conductors.
 - 5. Copper tape braided bonding jumpers.
 - 6. Tinned-copper braided bonding jumpers.
- C. Connectors: Bolted and exothermic-welded type.
- D. Grounding Electrodes:
 - 1. Ground Rods: Copper-clad steel.

1.4 GROUNDING APPLICATIONS

- A. Conductors: Solid for No. 8 AWG and smaller; stranded for No. 6 AWG and larger.
- B. Underground Grounding Conductors: Bare tinned-copper conductor, No. 4/0 AWG minimum.
- C. Isolated grounding conductors.
- D. Grounding bus.
- E. Conductor Terminations and Connections: Bolted and welded.
- F. Underground distribution systems.
- G. Insulated equipment grounding conductors with circuit conductors in all raceways.

- H. Signal and communication equipment.
- I. Service and central equipment locations and wiring closets.
- J. Terminal cabinets.
- K. Metal poles supporting outdoor lighting fixtures.

1.5 FIELD QUALITY CONTROL

- A. Ground Resistance Testing: By Contractor.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

1.1 PERFORMANCE REQUIREMENTS

- A. Rated Strength: Minimum structural safety factor of five times the applied force.

1.2 PRODUCTS

- A. Support, Anchorage, and Attachment Components:
 - 1. Steel slotted support systems with metallic coatings.
 - 2. Raceway and cable supports.
 - 3. Steel and malleable-iron conduit and cable hangers, clamps, and associated accessories.
 - 4. Support for non-armored conductors and cables in vertical conduit risers.
 - 5. Structural steel for fabricated supports and restraints.
 - 6. Mounting, Anchoring, and Attachment Components:
 - a. Powder-actuated fasteners.
 - b. Mechanical-expansion anchors.
 - c. Concrete inserts.
 - d. Clamps for attachment to steel structural elements.
 - e. All steel, springhead toggle bolts.
 - f. Threaded hanger rods.
- B. Fabricated Metal Equipment Support Assemblies: Welded or bolted steel shapes.
- C. Concrete Bases: 3000-psi 28-day compressive-strength concrete.

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

1.1 SUMMARY

- A. Raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 MATERIALS

- A. Metal Conduit and Tubing:
 - 1. Conduit: Rigid steel and PVC-coated steel.
 - 2. IMC and PVC-coated IMC.
 - 3. EMT.
 - 4. FMC: Zinc-coated steel.
 - 5. LFMC.
- B. Nonmetallic Conduit and Tubing: RNC.
- C. Optical Fiber/Communications Cable Raceway and Fittings: Plenum type.
- D. Metal Wireways: Sheet metal, NEMA Type 1 or 3R to suit location.
 - 1. Wireway Covers: Hinged or Flanged-and-gasketed type.
- E. Surface Raceways: Metal, galvanized steel.
- F. Boxes, Enclosures, and Cabinets:
 - 1. Outlet and Device Boxes: Sheet metal and Cast metal to suit location.
 - 2. Floor Boxes: Cast metal or Sheet metal to suit location.
 - 3. Pull and Junction Boxes: Sheet and Cast metal to suit location.
 - 4. Hinged-Cover Enclosures: Metal.
 - 5. Cabinets: Galvanized steel.
- G. Handholes and Boxes for Exterior Underground Wiring: Polymer concrete, prototype tested for compliance with SCTE 77.
- H. Sleeves for Raceways: Cast-iron pipe with integral waterstop.
- I. Sleeve Seals: EPDM sealing element.

1.3 INSTALLATION

- A. Raceway Applications:
 - 1. Outdoors:

- a. Exposed: Rigid steel.
 - b. Concealed, Aboveground: Rigid steel.
 - c. Underground: RNC, Type EPC-40-PVC, concrete encased if indicated.
 - d. Connection to Vibrating Equipment: LFMC.
 - e. Boxes and Enclosures, Aboveground: NEMA Type 3R.
 - f. Underground Handholes and Boxes: SCTE tier 15 structural load rating.
2. Indoors:
- a. Exposed: EMT.
 - b. Exposed and Subject to Severe Damage: Rigid steel or IMC.
 - c. Concealed: EMT.
 - d. Connection to Vibrating Equipment: FMC, except LFMC in damp or wet locations.
 - e. Damp or Wet Locations: Rigid steel or IMC.
 - f. Raceways for Distribution of Optical Fiber or Communications Cable: EMT.
 - g. Boxes and Enclosures: NEMA Type 1, except Type 4 in damp or wet locations.

END OF SECTION 260533

SECTION 260536 - CABLE TRAYS FOR ELECTRICAL SYSTEMS

1.1 QUALITY ASSURANCE

- A. Quality Standard: NEMA VE 1.

1.2 MATERIALS

- A. Cable Trays, Fittings, and Accessories: Aluminum, ladder type; or steel wire-basket type.
- B. Cable Tray Accessories:
 - 1. Cable tray supports and connectors.

1.3 SOURCE QUALITY CONTROL

- A. Tested according to NEMA VE 1.

END OF SECTION 260536

SECTION 260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

1.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: Verify with Structural drawings and specifications.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: Verify with Structural drawings and specifications.
 - a. Component Importance Factor: Verify with Structural drawings and specifications.
 - b. Component Response Modification Factor: Verify with Structural drawings and specifications.
 - c. Component Amplification Factor: Verify with Structural drawings and specifications.
3. Design Spectral Response Acceleration at Short Periods (0.2 Second): Verify with Structural drawings and specifications.
4. Design Spectral Response Acceleration at 1.0-Second Period: Verify with Structural drawings and specifications..

1.2 PRODUCTS

A. Vibration Isolators:

1. Neoprene pads.
2. Spring isolators.
3. Restrained spring isolators.

B. Seismic-Restraint Devices:

1. Channel support systems.
2. Galvanized Stainless-steel restraint cables.
3. Steel tube or steel slotted-support-system sleeve with internally bolted connections or reinforcing steel angle clamped hanger rod stiffeners.
4. Bushings for floor-mounted equipment anchors.
5. Bushing assemblies for wall-mounted equipment anchorage.
6. Resilient isolation washers and bushings.
7. Mechanical anchors.
8. Adhesive anchors.

C. Factory Finishes: Standard.

1.3 FIELD QUALITY CONTROL

- A. Testing: By Contractor.

END OF SECTION 260548

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

1.1 SUMMARY

A. Electrical Identification Materials and Devices:

1. Identification for raceway.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.
8. Circuit Breakers: All circuit breakers shall be labeled as to area served. Include room number and wall or specific equipment reference.

1.2 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and ANSI C2.**

1.3 PRODUCTS

- A. Raceway Identification (600V and less): Pretensioned, wraparound plastic sleeves and underground-line warning tape.**
- B. Raceway Identification (over 1000v): Painted Red.**
- C. Conductor and Cable Identification: Colored adhesive tape or aluminum, wraparound marker bands and brass or aluminum tags.**
- D. Equipment Labels: Engraved plastic and stenciled legend.**
- E. Warning Signs: Baked enamel and metal backed, butyrate.**
- F. Instruction Signs: Engraved, laminated acrylic or melamine plastic.**

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

1.1 PRODUCTS

- A. Relays: Electronic, zero-switching solid-state programmable units, with integral 120/277V programmable relays and manual override switches.
- B. Time Switches: Electronic, zero-switching solid-state programmable units, with channels necessary to perform required control.
- C. Outdoor Photoelectric Switches: Solid state, with dry contacts, 15-second time delay, and metal-oxide varistor surge protection.
- D. Indoor Photoelectric Switches: Ceiling-mounting and Skylight units; solid-state, light-level sensor with separate relay mounted on luminaire.
- E. Indoor Occupancy Sensors: Dual-technology type, solid-state units with separate, externally mounted relay unit.
- F. Lighting Contactors: Electrically operated and mechanically held, with fusible switch.
- G. Emergency Shunt Relay: Normally closed, electrically held, arranged for wiring in parallel with manual or automatic switching contacts.
- H. Control Cables:
 - 1. Power Cables: Not smaller than No. 12 AWG.
 - 2. Classes 2 and 3 Control Cables: Stranded-copper conductors, not smaller than No. 18 AWG.
 - 3. Class 1 Control Cables: Stranded-copper conductors, not smaller than No. 14 AWG.

END OF SECTION 260923

SECTION 260943 - NETWORK LIGHTING CONTROLS

1.1 SUMMARY

- A. Manually operated lighting controls with relays and control module.
- B. Manually operated, digital lighting controls with external signal source, relays and control module.

1.2 QUALITY ASSURANCE

- A. Quality Standard: 47 CFR, Subparts A and B, Class A; and IEC 60929, Annex E.

1.3 WARRANTY

- A. Materials and Workmanship: Two years.
- B. Costs of Replacement Parts that Failed in Service Due to Transient Voltage Surges: Eight years.
- C. Cost to Repair or Replace Electrically Held Relays: 10 years.
- D. Software Upgrades: Materials, workmanship, and programming for two years.

1.4 SOFTWARE SERVICE AGREEMENT

- A. Software technical support and upgrade services for two years.

1.5 PRODUCTS

- A. Expandability: Capable of increasing capacity by 25 percent of current capacity.
- B. Performance Requirements: Manual operation, internal timing and control unit, or an external source signals relays through programmable control module.
- C. Control Module: Microprocessor-based, solid-state, 365-day timing and control unit; pilot-duty, relay-type output circuits; integral keypad and alphanumeric LCD or LED display.
- D. Features:
 - 1. Interoperability: Compatible with BMS.
 - 2. Nonvolatile system memory.
 - 3. Lighting control software.
 - 4. Automatic time adjustment.

5. Astronomic control.
6. Demand control.
7. On-off confirmation signal.
8. Remote communication capability.
9. Local override capability.
10. Automatic control of local override.
11. Automatic battery backup.
12. Programmed time signal.
13. Daylight balancing dimming control.
14. Daylight compensating switch control.
15. Bilevel controls.
16. Flick warning.
17. Diagnostics.
18. Local data-entry devices: PCs, PDAs, hand-held IR devices, and wired or wireless Ethernet hubs.

E. Power Distribution Components: Modular relay panel and line-voltage surge suppression.

F. Manual Switches: Momentary contact, low-voltage push buttons and maintained contact, full- or low-voltage switches, with integral pilot light; finish plates and legends.

G. Conductors and Cables:

1. No. 12 AWG power wiring to supply side of Class 2 power source.
2. Classes 2 and 3 Control Cable: Multiconductor cable with copper conductors.
3. Class 1 Control Cable: Multiconductor cable with copper conductors.
4. Digital and Multiplexed Signal Wire: Unshielded, Category 6 twisted-pair cable.

1.6 INSTALLATION

A. Wiring Method: In raceways.

B. Field-mounting transient voltage suppressors for lighting control devices installed in Category A locations that do not have integral line-voltage surge protection.

C. Software installation and user-variable programming.

END OF SECTION 260943

SECTION 262413 - SWITCHBOARDS

1.1 QUALITY ASSURANCE

- A. Quality Standards: NEMA PB 2, NFPA 70, and UL 891.

1.2 PRODUCTS

- A. Manufactured Units:

- 1. Front-connected, front-accessible switchboards.
 - a. Main Devices: Fixed, individually mounted.
 - b. Branch Devices: Panel mounted.
 - c. Sections front and rear aligned.
- 2. Main-Bus Continuous:
- 3. Constructed to withstand seismic forces.
- 4. Indoor Enclosures: Steel, NEMA 250, Type 1.
 - a. Finish: Standard gray color.
- 5. Outdoor Enclosures: Type 3R.
 - a. Finish: Standard color; undersurfaces treated with corrosion-resistant undercoating.
 - b. Enclosure: Flat roof; bolt-on rear covers for each section, with provisions for padlocking.
 - c. Doors: 30 inches; opening outwards; with panic hardware and provisions for padlocking.
- 6. Customer metering compartment.
- 7. Bus transition and incoming pull sections.
- 8. Hinged front panels.
- 9. Pull box on top of switchboard.
- 10. Buses and Connections: Three phase, four wire; copper or tin-plated aluminum.
- 11. Future device provisions.

- B. Transient Voltage Suppression Devices: Integrally mounted, bolt-on, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, short-circuit current rating matching or exceeding the switchboard short-circuit rating.

- 1. Peak Single-Impulse Surge Current Rating: 160 kA per mode/320 kA per phase.
- 2. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.

3. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 and 208Y/120-V, three-phase, four-wire circuits shall be as follows:
 - a. Line to Neutral: 800 V for 480Y/277, 400 V for 208Y/120.
 - b. Line to Ground: 800 V for 480Y/277, 400 V for 208Y/120.
 - c. Neutral to Ground: 800 V for 480Y/277, 400 V for 208Y/120.

- C. Disconnecting and Overcurrent Protective Devices:
 1. Molded-case circuit breaker (MCCB), with interrupting capacity to meet available fault currents.
 - a. Thermal-magnetic circuit breakers.
 - b. Adjustable instantaneous-trip circuit breakers.
 - c. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replaceable electronic trip; and field-adjustable settings.
 - d. Accessories:
 - 1) Lugs: Mechanical style.
 - 2) Ground-Fault Protection: Integrally mounted.
 - 3) Shunt trip.
 - 4) Auxiliary Contacts: Two SPDT switches.
 2. Fused Switch: NEMA KS1, Type HD.

- D. Instrumentation:
 1. Instrument Transformers:
 - a. Potential transformers.
 - b. Current transformers.
 - c. Control-power transformers.
 - d. Current transformers for neutral and ground-fault current sensing.
 2. Multifunction digital-metering monitor.
 3. Ammeters, voltmeters, and power-factor meters.
 4. Instrument switches.

- E. Control Power: 120-V ac.

- F. Accessories:
 1. Accessory set including tools.
 2. Portable test set.
 3. Spare-fuse cabinet.

- G. Identification:
 1. Service equipment label.

1.3 FIELD QUALITY CONTROL

- A. Testing: By Contractor.

END OF SECTION 262413

SECTION 262416 - PANELBOARDS

1.1 QUALITY ASSURANCE

- A. Quality Standards: NEMA PB 1 and NFPA 70.

1.2 PRODUCTS

A. General Requirements for Panelboards:

1. Constructed to withstand seismic forces.
2. Enclosures: Flush and surface mounted.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Kitchen or Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 5.
 - f. Front: Hinged cover.
 - g. Optional Enclosure Features: Skirt for surface-mounted panelboards.
 - h. Directory card.
3. Incoming Mains Location: Top and bottom.
4. Phase, Neutral, and Ground Buses: Copper or Aluminum.
 - a. Optional Buses: Equipment ground, isolated ground and extra-capacity neutral.
5. Conductor Connectors: Mechanical-type main and neutral lugs.
 - a. Optional Features: Mechanical-type feed-through lugs, sub-feed lugs and extra-capacity neutral lugs.
6. Service equipment label for panelboards incorporating one or more main service disconnecting and overcurrent protective devices.
7. Panelboard Short-Circuit Current Rating: Fully or Series rated to interrupt symmetrical short-circuit current available at terminals.

B. Distribution Panelboards:

1. Mains: Circuit breaker or Fused switch Lugs only.
2. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.
3. Fused switches.
4. Contactors in Main Bus: NEMA ICS 2, Class A, with control-power transformer control-power source.

- C. Lighting and Appliance Branch-Circuit Panelboards:
 - 1. Mains: Circuit breaker, fusible switch or lugs only.
 - 2. Branch Overcurrent Protective Devices: Bolt-on circuit-breaker or fusible switch type.
 - 3. Contactors in Main Bus: NEMA ICS 2, Class A, with control-power transformer 120-V 24-V control-power source.

- D. Disconnecting and Overcurrent Protective Devices:
 - 1. Molded-Case Circuit Breaker: Interrupting capacity to meet available fault currents.
 - a. Circuit Breakers: Thermal-magnetic, adjustable instantaneous-trip, electronic-trip, current-limiting, GFC and IGFEP types.
 - b. Features and Accessories:
 - 1) Lugs: Mechanical style.
 - 2) Appropriate for Application: Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - 3) Ground-Fault Protection: Integrally mounted relay and trip unit.
 - 4) Shunt Trip: 120-V trip coil.
 - 5) Auxiliary Contacts: Two SPDT switches.
 - 6) Handle padlocking devices and clamps.
 - 2. Fused Switch: NEMA KS 1, Type HD.
 - a. Auxiliary contacts.

- E. Panelboard Suppressors: Integrally mounted, bolt-on, solid-state, parallel-connected, modular type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating.
 - 1. Accessories:
 - a. Fuses rated at 200-kA interrupting capacity.
 - b. Fabrication using bolted compression lugs for internal wiring.
 - c. Integral disconnect switch.
 - d. Redundant suppression circuits.
 - e. Redundant replaceable modules.
 - f. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
 - g. LED indicator lights for power and protection status.
 - h. Audible alarm, with silencing switch, to indicate when protection has failed.
 - i. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation.
 - j. Four-digit, transient-event counter set to totalize transient surges.

2. Peak Single-Impulse Surge Current Rating: 160kA per mode/320kA per phase.
3. Minimum Single-Impulse Current Ratings, Using 8-by-20-Mic.Sec. Waveform:
 - a. Line to Neutral: 70,000 A.
 - b. Line to Ground: 70,000 A.
 - c. Neutral to Ground: 50,000 A.
4. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.
5. Protection modes and UL 1449 SVR for Grounded Wye Circuits with 480Y/277 or 208Y/120-V, Three-Phase, Four-Wire Circuits:
 - a. Line to Neutral: 800 V for 480Y/277, 400 V for 208Y/120.
 - b. Line to Ground: 800 V for 480Y/277, 400 V for 208Y/120.
 - c. Neutral to Ground: 800 V for 480Y/277, 400 V for 208Y/120.

F. Accessories:

1. Accessory set including tools.
2. Portable test set.

1.3 FIELD QUALITY CONTROL

- A. Testing: By Contractor.

END OF SECTION 262416

SECTION 262419 - MOTOR-CONTROL CENTERS

1.1 SUMMARY

- A. Motor-control centers for use on ac circuits rated 600 V and less.

1.2 PRODUCTS

- A. Motor-Control Centers:

- 1. Wiring: NEMA ICS 3, Class I, Type B.
- 2. Enclosures: NEMA 250, Type 1 for indoor and Type 3R for outdoor locations.
- 3. Buses: Plated copper or aluminum with full-size neutral bus and equipment ground bus.
- 4. Functional Features: Modular compartmental arrangement.
 - a. Controller units with fusible or non-fusible disconnecting means.
 - b. Individually mounted overcurrent protective devices.
 - c. Transient voltage surge suppressors.
 - d. Spaces and blank units.
 - e. Spare units.

- B. Across-the-Line Controllers: NEMA ICS 2, Class A.

- 1. Manual Controller: General purpose.
- 2. Magnetic Controller: Full voltage, nonreversing.
 - a. Control Circuit: 120 V, integral control power transformer, with a control power source, plus 100 percent spare capacity.
 - b. Overload Relay: Dip switch selectable with Class II ground fault protection.

- C. Reduced-Voltage Controllers: NEMA ICS 2.

- 1. Star delta.
- 2. Part winding.
- 3. Autotransformer reduced voltage.
- 4. Solid state, reduced voltage.

- D. Multispeed Controllers: NEMA ICS 2.

- 1. Matched to motor type, application, and number of speeds.

- E. Feeder Overcurrent Protection: Fusible switch.

- F. Accessories:

- 1. Push-button stations, pilot lights, and selector switches.
- 2. Control relays.

3. Phase-failure and undervoltage relays.
4. Spare-fuse cabinet.

1.3 FIELD QUALITY CONTROL

- A. Testing: By Contractor-engaged agency.
- B. Test Procedure: NETA ATS.

END OF SECTION 262419

SECTION 262713 - ELECTRICITY METERING

1.1 SUMMARY

- A. This Section includes equipment for electricity metering by Owner (in addition to the utility metering).

1.2 EQUIPMENT FOR ELECTRICITY METERING BY OWNER

- A. Kilowatt-Hour/Demand Meter: Electronic three-phase meters, measuring electricity use and demand. Digital liquid-crystal display, including historic peak demand.
 - 1. Demand Signal Communication Interface: Match signal to remote building automation system.
 - 2. Programmable Contact Module.
 - 3. Memory Backup: Self-contained to maintain memory throughout power outages of 72 hours, minimum.
 - 4. Sensors: Current-sensing type, with current or voltage output.
 - a. Type: Split and solid core.
 - 5. Current-Transformer Cabinet: Listed by manufacturer for use with sensors indicated.

END OF SECTION 262713

SECTION 262726 - WIRING DEVICES

1.1 PRODUCTS

- A. Receptacles: Duplex, 125 V, 20 A.
 - 1. Straight Blade.
 - 2. GFCI: Non-feed through.
 - 3. Isolated Ground.
 - 4. Hazardous (classified) location receptacles.
 - 5. Twist-locking type with isolated-ground terminal.
- B. Pendant cord-connector devices with external cable grip.
- C. Cord and plug sets.
- D. Snap Switches: 120/277 V, 20 A.
 - 1. Pilot light switches.
 - 2. Key-operated switches.
 - 3. Single-pole, double-throw, momentary contact, center-off switches.
 - 4. Key-operated, single-pole, double-throw, momentary contact, center-off switches.
- E. Occupancy Sensors:
 - 1. Wall-Switch Sensors: Adaptive-technology type with adjustable time delay.
 - 2. Wall-Switch Sensors: Dual-technology type with adjustable time delay.
 - 3. Ceiling Sensors: Dual-technology type with adjustable time delay.
- F. Wall Plates:
 - 1. Material for Finished Spaces: Selected from a full range of standard and custom metal finishes and materials.
 - 2. Material for Unfinished Spaces: Galvanized steel.
 - 3. Material for Damp and Wet Locations: Cast aluminum.
- G. Floorboxes: Modular, flush-type or flap-type, single-service, dual-service, and three-service units suitable for wiring method used as required.
 - 1. Type: Flush.
 - 2. Service Plate: Rectangular, brass.
 - 3. Voice and Data Communication Outlet: As per program.
- H. Poke-Through Assemblies: Below-floor junction box with multichanneled, through-floor raceway/firestop and detachable floor service outlet assembly.
 - 1. Service Outlet Assembly: Flush type.
 - 2. Size: 3 inch or 4 inch.

- I. Multioutlet Assemblies: Metal raceways.

- J. Finishes:
 - 1. Connected to Normal Power System: As selected by Architect.
 - 2. Connected to Emergency Power System: As selected by Architect.
 - 3. Isolated-Ground Receptacles: As specified above, with orange triangle on face.

END OF SECTION 262726

SECTION 262813 - FUSES

1.1 SUMMARY

- A. Cartridge fuses rated 600 V and less for use in switches panelboards switchboards controllers and motor-control centers.
- B. Spare-fuse cabinets.

1.2 QUALITY ASSURANCE

- A. Quality Standard: NEMA FU 1.

1.3 PRODUCTS

- A. Cartridge Fuses: Nonrenewable.
- B. Spare-Fuse Cabinet: Wall-mounted steel unit with fuse pullers for each size of fuse.

1.4 INSTALLATION

- A. Fuse Applications:
 - 1. Feeders: Class L, time delay or RK1, time delay.
 - 2. Motor Branch Circuits: Class RK5, time delay.
 - 3. Other Branch Circuits: Class J, time delay.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

1.1 SUMMARY

- A. Individually mounted, enclosed switches and circuit breakers used for the following:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Molded-case circuit breakers.
 - 4. Elevator disconnect switches.
 - 5. Enclosures.

1.2 PRODUCTS

- A. Fusible and Nonfusible Switches:
 - 1. Fusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD.
 - 2. Nonfusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD.
 - 3. Accessories:
 - a. Equipment ground kit.
 - b. Neutral kit.
 - c. Auxiliary contact kit.
- B. Enclosed Circuit Breakers and Switches:
 - 1. Molded-Case Circuit Breakers: NEMA AB 1; thermal-magnetic adjustable instantaneous-trip electronic-trip current-limiting integrally fused and GFCI types.
 - 2. Molded-case switches.
 - 3. Mechanical lug style.
 - 4. Shunt trip set at 55 percent of rated voltage.
 - 5. Auxiliary Switch: Two SPDT switches.
- C. Elevator Disconnect Switches:
 - 1. Shunt trip fusible switch with auxiliary contacts and control relays for interface to the elevator controller and fire alarm system.
- D. Enclosures: NEMA AB 1 and NEMA KS 1.
 - 1. Outdoor Locations: Type 3R.
 - 2. Kitchen Areas: Type 4X.
 - 3. Other Wet or Damp Indoor Locations: Type 4.
 - 4. Hazardous Areas: Type 7C.

1.3 FIELD QUALITY CONTROL

- A. Testing: By Contractor.

END OF SECTION 262816

SECTION 262923 - VARIABLE-FREQUENCY MOTOR CONTROLLERS

1.1 SUMMARY

- A. Solid-state, PWM, VFCs for speed control of three-phase, squirrel-cage induction motors.

1.2 PRODUCTS

- A. Variable Frequency Controllers: NEMA ICS 2, IGBT, PWM, VFC for 3-phase, premium-efficiency induction motors.
 - 1. Rating: VFC shall be rated at a minimum of 110% of motor load.
 - 2. Output Rating: 6 to 66 Hz.
 - 3. Input AC Voltage: 380 to 500 V.
 - 4. Input Frequency: 50 to 60 Hz, plus or minus 6 percent.
 - 5. Minimum Efficiency: 96 percent at 60 Hz, full load.
 - 6. Minimum Displacement Primary-Side Power Factor: 96 percent.
 - 7. Overload Capability: 10 percent for 60 seconds; 100 percent for 3 seconds.
 - 8. Starting Torque: 100 percent.
 - 9. Speed Regulation: Plus or minus 1 percent.
 - 10. Isolated control interface allows controller to follow control signal over an 11:1 speed range.
 - 11. Multiple-motor capability.
 - 12. Automatic reset/restart.
 - 13. Power-interruption protection.
 - 14. Torque boost.
 - 15. Motor temperature compensation at slow speeds.
 - 16. Input line conditioning.
 - a. For motors 10HP and less: DC choke and AC line reactor.
 - b. For Motors > 10HP: Harmonic filtering to limit input current THD to <15%, measured at the input terminals to the VFC.
 - 17. VFC output filtering.
 - 18. Door-mounted LED status lights.
 - 19. Panel-mounted operator station.
 - 20. Meters or digital indicating devices.
 - 21. Control signal interface (Coordinate with BMS).
 - a. Electric input signal interface.
 - b. Pneumatic input signal interface.
 - c. Remote signal inputs.
 - d. Output signal interface.
 - e. Remote indication interface.

22. Communications: Factory installed interface module for communication with the Building Automation System.
23. Integral disconnecting means.

B. Accessories:

1. Push-button stations, pilot lights, and selector switches.
2. Stop and lockout push-button station.
3. Control relays for time delay.
4. Standard displays.
5. Historical logging information and displays.
6. Current-sensing, phase-failure relays for bypass controller.

1.3 FIELD QUALITY CONTROL

- A. Testing: By Contractor-engaged agency.

END OF SECTION 262923

SECTION 263213 - ENGINE GENERATORS

1.1 SUMMARY

- A. Packaged diesel-engine generator sets.

1.2 QUALITY ASSURANCE

- A. Quality Standard: NEMA MG 1 and NFPA 37.
- B. Emergency Power Supply System: NFPA 110, Level 1.
- C. Safety Standard: ASME B15.1.

1.3 PROJECT CONDITIONS

- A. Environmental Conditions: Minus 15 to 40 deg C and 4500 feet altitude.

1.4 WARRANTY

- A. Materials and Workmanship: Two years.

1.5 ENGINE-GENERATOR SET

- A. Output Connections: Three-phase, four wire.
- B. Performance: Suitable for loads involving sensitive electronic equipment, adjustable frequency drives, or uninterruptible power supply systems.
- C. Fuel: Fuel oil, Grade DF-2
- D. Governor: Adjustable isochronous, with speed sensing.
- E. Engine Cooling System: Integral radiator.
- F. Fuel Oil Storage:
 - 1. Base-Mounted Fuel Oil Tank: Capacity for 18 hours' operation.
- G. Engine Exhaust System: Critical-type muffler.
- H. Combustion-Air Intake: Standard-duty, engine-mounted air cleaner with replaceable dry-filter element.
- I. Starting System: Electric motor, 24 V, with battery and battery charger.

- J. Control and Monitoring: Automatic starting; with control devices grouped on panel mounted on generator.
 - 1. Common remote audible alarm.
 - 2. Remote alarm annunciator.
 - 3. Remote emergency-stop switch.

- K. Generator Overcurrent and Fault Protection:
 - 1. Generator Circuit Breaker: Molded-case, electronic-trip type.
 - 2. Microprocessor-based generator protector.
 - 3. Ground-fault indication.

- L. Generator: Directly connected to engine shaft, with drip-proof enclosure and solid-state voltage regulator.

- M. Outdoor Generator-Set Enclosure: Vandal-resistant, sound-attenuated weatherproof steel housing.

1.6 SOURCE QUALITY CONTROL

- A. Testing: Prototype at factory.

1.7 INSTALLATION

- A. Mounting: On concrete base with restrained-spring vibration isolators.

1.8 FIELD QUALITY CONTROL

- A. Testing: By Contractor-engaged agency.

END OF SECTION 263213

SECTION 263600 - TRANSFER SWITCHES

1.1 SUMMARY

- A. Transfer switches rated 600 V and less.

1.2 QUALITY ASSURANCE

- A. Quality Standards: NEMA ICS 1, NFPA 70, NFPA 110, and UL 1008.

1.3 PRODUCTS

- A. General:

1. Solid-state controls.
2. Resistant to damage by voltage transients.
3. Solenoid or electric-motor operated.
4. Designed for continuous-duty, repetitive transfer of full-rated current.
5. Neutral switched for four-pole switches.
6. Neutral terminals for single-phase, three-wire or three-phase, four-wire systems without neutral switching.
7. Oversize neutrals.
8. Heaters for switches exposed to outdoor temperatures and humidity.
9. Battery charger for generator starting batteries.
10. Annunciation, control, and programming interface components.
11. Enclosures: NEMA 250, Type 1.

- B. Automatic Transfer Switches: NFPA 110, Level 1.

1. Type: Double throw.
2. Manual Switch Operation: Under load.
3. Signal-before-transfer contacts.
4. Digital communication interface.
5. Control Features: Automatic open transition.
6. Features:
 - a. Undervoltage sensing for each phase of normal source.
 - b. Time delay for override of normal-source sensing.
 - c. Voltage/frequency lockout relay.
 - d. Time delay for retransfer to normal source.
 - e. Test switch.
 - f. Switch-position pilot lights.
 - g. Source-available indicating lights.
 - h. Unassigned auxiliary contacts.
 - i. Transfer override switch.
 - j. Engine starting contacts.

- k. Engine Shutdown Contacts: Time delay adjustable.
- l. Engine-generator exerciser with programmable-time switch.

1.4 FIELD QUALITY CONTROL

- A. Testing: By Manufacturer's service representative.

END OF SECTION 263600

SECTION 264313 - TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

1.1 SUMMARY

- A. Transient voltage surge suppressors for low-voltage power equipment.

1.2 QUALITY ASSURANCE

- A. Quality Standards: IEEE C62.41, IEEE C62.45, NEMA LS 1, UL 1283, and UL 1449.

1.3 PRODUCTS

- A. Service Entrance Suppressors: Modular type.
 - 1. Peak Single-Impulse Surge Current Rating: 240 kA per phase.
 - 2. Circuits: Grounded wye.
- B. Panelboard Suppressors: Modular type.
 - 1. Peak Single-Impulse Surge Current Rating: 80 kA per phase.
 - 2. Circuits: Grounded wye.
- C. Plug-in Surge Suppressors: Non-modular, plug-in type, with at least four receptacles.
 - 1. Close-coupled direct plug-in 15-foot line cord.
 - 2. Peak Single-Impulse Surge Current Rating: 33 kA per phase.

1.4 FIELD QUALITY CONTROL

- A. Testing: By Contractor.

END OF SECTION 264313

SECTION 265100 - INTERIOR LIGHTING

1.1 SUMMARY

- A. Interior lighting fixtures (including fixtures mounted on exterior of building), lamps, and ballasts.
- B. Exit signs.
- C. Lighting fixture supports.

1.2 QUALITY ASSURANCE

- A. Quality Standard for Fixtures in Hazardous Locations: FMG.
- B. Quality Standard for Exit Signs: UL 924.
- C. Mockups.

1.3 WARRANTY

- A. Emergency Fluorescent Ballasts: Seven years.
- B. Electronic Ballasts: Five years.
- C. T5 and T8 Fluorescent Lamps: One year(s).

1.4 PRODUCTS

- A. Ballasts for Linear Fluorescent Lamps:
 - 1. Electronic Ballasts:
 - a. Type: Programmed start.
 - b. Sound Rating: A.
 - c. Total harmonic distortion rating of less than 20 percent.
 - d. Transient Voltage Protection: Category A or better.
 - e. Lamp Current Crest Factor: 1.7 or less.
 - f. BF: 0.72.
 - g. Power Factor: 0.98 or higher.
 - h. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.
 - 2. Electronic Programmed-Start Ballasts for T5 and T5HO Lamps:
 - a. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
 - b. Automatic lamp starting after lamp replacement.
 - c. Sound Rating: A.
 - d. Total Harmonic Distortion Rating: Less than 20 percent.
 - e. Transient Voltage Protection: IEEE C62.41, Category A or better.

- f. Operating Frequency: 20 kHz or higher.
 - g. Lamp Current Crest Factor: 1.7 or less.
 - h. BF: 0.95 or higher, unless otherwise indicated.
 - i. Power Factor: 0.98 or higher.
 3. Single ballasts for multiple lighting fixtures.
 4. Ballasts for Low-Temperature Environments:
 - a. Temperatures 0 Deg F and Higher: Electronic.
 5. Ballasts for Bi-Level Controlled Lighting Fixtures: Electronic type.
 - a. High-Level Operation: 100 percent of rated lamp lumens.
 - b. Low-Level Operation: 30 percent of rated lamp lumens.
- B. Ballasts for Compact Fluorescent Lamps: Electronic.
- C. Ballasts for High-Intensity-Discharge Lamps:
 1. Electromagnetic Type for Metal-Halide Lamps: Constant-wattage autotransformer or regulating high-power-factor, low-noise type.
 2. Electronic type for metal-halide lamps.
 3. Auxiliary instant-on quartz system.
- D. Exit Signs: Internally lighted.
 1. 70,000-hour light-emitting diodes.
- E. Fluorescent Lamps:
 1. Low-mercury lamps.
 2. T8 rapid-start, low-mercury lamps, rated 32 W maximum, 3100 initial lumens and 20,000 hours average lamp life.
 3. T5 rapid-start, low-mercury lamps, rated 28 W maximum.
 4. T5HO rapid-start, low-mercury lamps, rated 54 W maximum.
 5. Compact Fluorescent Lamps: T4 double tube, low mercury, rated 13, 18, 26, 32, 42 or 55 W.
- F. High-Intensity-Discharge Lamps:
 1. Metal-halide lamps.
 2. Pulse-start, metal-halide lamps.
 3. Ceramic, pulse-start, metal-halide lamps.
- G. Lighting fixture support components.

END OF SECTION 265100

SECTION 265600 - EXTERIOR LIGHTING

1.1 SUMMARY

- A. Exterior luminaires with lamps and ballasts, poles and accessories.
- B. Section does not include exterior luminaires mounted on exterior of building.

1.2 PERFORMANCE REQUIREMENTS

- A. Live Load: Single load of 500 lbf.
- B. Ice Load: 3 lbf/sq. ft..
- C. Wind Load:
 - 1. Wind speed for poles 50 feet or less in height is 110 mph.

1.3 QUALITY ASSURANCE

- A. Quality Standard: AASHTO LTS-4, IEEE C2.

1.4 WARRANTY

- A. Materials and Workmanship for Luminaires: Five Insert number years.
 - 1. Metal Corrosion: Five years.
 - 2. Color Retention: Five years.
- B. Materials and Workmanship for Lamps: Lamps and fuses that fail within 12 Insert number months.
- C. Finish, Materials, and Workmanship for Poles: Three Insert number.

1.5 PRODUCTS

- A. Luminaire Finishes:
 - 1. Steel Luminaires: Factory painted, polyurethane enamel.
 - 2. Aluminum Luminaires: Natural satin Class I, clear anodic Class I, color anodic finish.
- B. Fluorescent Ballasts and Lamps: Suitable for low-temperature environments. Low-mercury-type lamps.

- C. High-Intensity-Discharge Lamp Ballasts: Constant-wattage autotransformer or regulating high-power-factor type and suitable for low-temperature starting.
- D. High-Intensity-Discharge Lamps: Pulse-start, metal-halide Ceramic, pulse-start, metal-halide lamps.
- E. Steel Poles: Round, tapered Round, straight Square, tapered Square, straight.
 - 1. Brackets for luminaires.
 - 2. Pole-top tenons.
 - 3. Grounding and bonding lugs.
 - 4. Cable support grip.
 - 5. Finish: Factory painted.
- F. Aluminum Poles: Seamless, extruded structural tube.
 - 1. Pole-top tenons.
 - 2. Grounding and bonding lugs.
 - 3. Brackets for luminaires.
 - 4. Finish: Factory painted.

END OF SECTION 265600

SECTION 280500 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

1.1 SUMMARY

- A. Electronic safety and security equipment coordination, sleeves and seals for raceways and cables, and common electronic safety and security installation requirements.

1.2 MATERIALS

- A. Sleeves for Raceways and Cables:
 - 1. Steel pipe sleeves.
 - 2. Cast-iron pipe sleeves.
 - 3. Sleeves for rectangular openings.
- B. Sleeve Seals: Modular sealing devices with sealing elements, pressure plates, and steel connecting bolts and nuts.

END OF SECTION 280500

SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

1.1 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL with a field supervisor certified by BICSI as an RCDD.

1.2 MATERIALS

- A. Cable Supports: Support brackets, lacing bars, spools, J-hooks, and D-rings.
- B. Backboards: Plywood, fire-retardant treated.
- C. Low-Voltage Control Cable:
 - 1. Paired Lock Cable: No. 16 AWG, plenum-rated, Type CMP, No. 18 AWG, plenum-rated, Type CMP, twisted pair.
 - 2. Class 1 Control Circuits: Stranded copper, Type THHN-THWN.
 - 3. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway.
 - 4. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF.
- D. Fire Alarm Wire and Cable: Complying with NFPA 70, Article 760.
 - 1. Signaling Line Circuits: Twisted, shielded pair circuit integrity cable.
 - 2. Non-Power-Limited Circuits: Solid-copper conductors, 600-V, 75 deg C.
 - a. Low-Voltage Circuits: No. 16 AWG, minimum.
 - b. Line-Voltage Circuits: No. 12 AWG, minimum.
 - c. Multiconductor Armored Cable: Two-hour rating, Type MC.

1.3 INSTALLATION

- A. General Wiring Method: In raceways, except in accessible indoor ceiling spaces and attics.
- B. Wiring Method of Fire Alarm System: Installed in a dedicated raceway system, not used for any other wire or cable.

1.4 FIELD QUALITY CONTROL

- A. Testing: By Contractor-engaged agency.

END OF SECTION 280513

SECTION 281300 - ACCESS CONTROL

1.1 SUMMARY

- A. Central Station, software, and field-installed Controllers connected by a high-speed electronic data transmission network. Included are:
 - 1. Access Control:
 - a. Regulating access through doors, gates.
 - b. Anti-passback.
 - c. Visitor assignment.
 - d. Credential cards and readers.
 - e. Enrollment center.
 - f. RS-232 ASCII interface.
 - g. Credential creation and credential holder database and management.
 - 2. Security:
 - a. Video and camera control.
 - b. Interface with video surveillance systems.
- B. System Description:
 - 1. System Software: Based on 32-bit, Microsoft Windows NT central-station, workstation operating system, server operating system, and application software:
 - a. Multiuser multitasking.
 - b. Graphical user interface.
 - c. System license for the entire system.
 - d. Open architecture that allows importing and exporting of data and interfacing with other systems that are compatible with Microsoft Windows operating system.
 - e. Password-protected operator login and access.
 - 2. Network Connecting the Central Station and Workstations: WAN using Microsoft Windows-based TCP/IP with a capacity of connecting up to 99 workstations.
 - 3. Network(s) Connecting PCs and Controllers:
 - a. Direct-connected, RS-232 cable from the COM port of the Central Station to the first Controller, then RS-485 to interconnect the remainder of the Controllers at that Location.

1.2 PERFORMANCE REQUIREMENTS

- A. Single database for access-control and credential-creation functions.

- B. Distributed processing.
 - C. Support at least 2,000 separate Locations.
 - D. Data Capacity:
 - 1. 130 different card-reader formats.
 - 2. 999 comments.
 - 3. 16 graphic file types for importing maps.
 - E. Location Capacity:
 - 1. 128 reader-controlled doors.
 - 2. 50,000 total access credentials.
 - 3. 2048 supervised alarm inputs.
 - 4. 2048 programmable outputs.
 - 5. 32,000 custom action messages per Location to instruct operator on action required when alarm is received.
 - F. System Response to Alarms: System end-to-end response time of 1 second or less. Alarms annunciated at the Central Station within 1 second of the alarm occurring at a Controller or device controlled by a local Controller, and within 100 ms if the alarm occurs at the Central Station. Alarm and status changes displayed within 100 ms after receipt of data by the Central Station. Graphics, including graphics-generated map displays, displayed on the console monitor within 5 seconds of alarm receipt at the security console. Response time maintained during system heavy load.
 - G. False Alarm Reduction: Comply with SIA CP-01.
 - H. Error Detection: Detect single- and double-bit errors, burst errors of eight bits or less, and at least 99 percent of all other multibit and burst error conditions.
 - I. Data Line Supervision: System initiates alarm in response to opening, closing, shorting, or grounding of data transmission lines.
- 1.3 QUALITY ASSURANCE
- A. Installer Qualifications: Must have on staff a registered communication distribution designer certified by Building Industry Consulting Service International.
 - B. Quality Standards: SIA DC-01 and SIA DC-03 and SIA DC-07.
- 1.4 HARDWARE
- A. Central-Station Computer: Standard unmodified PC of modular design.
 - 1. CD-ROM Drive: 650 MB.

2. Dot matrix alarm printer.
 3. Laser report printer.
 4. LAN Adapter Card: 10/100 Mbps internal network interface card.
 5. Redundant central computer.
- B. Workstations: Similar to Central Station; with redundant workstation.
- C. UPS: Sized for 6 hours of operation of the central-station equipment, including 2 hours of alarm printer operation. Comply with campus standards.
- D. Fixed Map Display: Layout of the protected facilities. Comply with campus standards.
- E. Controllers: Intelligent peripheral control unit.
- F. Secondary alarm annunciator.
- G. Keypads: With unique combinations of alphanumeric and other symbols as an Identifier; includes duress codes. Comply with campus standards.
- H. Card Readers: Visual audible status indications and user prompts.
1. Touch plate and proximity readers.
- I. Enrollment Center: Uses a dedicated workstation PC.
1. Equipment to enroll selected credentials.
 2. Card Size: Standard size, 2-1/8 by 3-3/8 inches.
 3. Card Construction: Core and laminate or monolithic, with useful lifetime of at least 5 years or 5000 insertions or swipes. Includes holographic images as a security enhancement.
 4. Card-Making Equipment: Consisting of a workstation, video camera, video-imaging equipment, and a printer.
 - a. Camera: NTSC color standard with RGB video output and 470 lines minimum horizontal resolution.
 - b. Video Imaging: Live-image capture software and hardware and a digital signature capture pad.
 - c. Printer: Dye-sublimation resin thermal transfer, 300 dpi resolution. Throughput not less than 60 seconds per card.
- J. Cables: NFPA 70 types CM, CMP, CMG, and CMR; multiconductor, jacketed.
- K. Cable and Asset Management: Computer based, with integrated database and graphic capabilities.
- 1.5 INSTALLATION
- A. Wiring Method: In raceway and cable tray except within cabinets.

1.6 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor engaged.
- B. Test Procedure: TIA/EIA-568-1, TIA/EIA-568-B.

1.7 STARTUP SERVICE

- A. Owner's operators, management, and security personnel enrolled and badges and access cards prepared.

END OF SECTION 281300

SECTION 281600 - INTRUSION DETECTION

1.1 SUMMARY

- A. Intrusion detection with hard-wired modular, microprocessor-based controls, intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions.

1.2 QUALITY ASSURANCE

- A. FMG approved and labeled.

1.3 WARRANTY

- A. Materials and Workmanship: One year.

1.4 PRODUCTS

- A. Functional Description of System.
 - 1. System Control: Central-station control unit directly monitors intrusion detection devices.
 - 2. Timed control of central-station control unit.
 - 3. Automatic control of closed-circuit television cameras.
 - 4. Printed record of events.
 - 5. Circuit supervision.
 - 6. Secure-Access Control: Programmable.
- B. System Component Requirements:
 - 1. Existing system compatibility.
 - 2. Surge protection.
 - 3. Interference protection.
 - 4. Tamper protection.
 - 5. Self-testing devices.
- C. Power Continuity for Central-Station Control Unit and Controllers: Rechargeable, recombinant, lead-acid type batteries; with battery charger.
- D. Secure and Access Devices: Keypad and display module.
- E. Door and Window Switches: Balanced-magnetic type.
- F. Intrusion Detection Devices: Door position switches, microwave-PIR dual technology motion sensors, and video motion sensor (interior).

- G. Central-Station Control Units: Modular, with separate and independent alarm and supervisory modules; [UL 609] [UL 1023] [UL 1076].
 - 1. Alarm Indication: Audible signal and plain language identification on LED or LCD display, and plain-language identification on LED, LCD, or cathode-ray-tube display at central-station control unit.
 - 2. Timing Unit: Solid state, programmable, 365 days.
 - 3. Alphanumeric display and system controls.
 - 4. Power supply circuits.
 - 5. UPS.
 - 6. Lockable, steel cabinet.

- H. Annunciator: Visual displays, duplicate LEDs, audible alarm, silence-reset switch, UPS, and test switch enclosed in cabinet with two hinged doors.

- I. Central-Station Control Unit.:
 - 1. Hardware: Microprocessor, monitor, keyboard, hard disk, floppy disk, CD-ROM, modem, UPS, alarm printer, and report printer.
 - 2. Software: System access control, alarm monitoring, monitor display, system test, and report generator types.

- J. Audible and Visual Alarm Devices: Siren and strobe.

1.5 INSTALLATION

- A. Installation: UL 681 and UL 1641.
- B. Wiring Method: In raceways.

1.6 FIELD QUALITY CONTROL

- A. Testing: By Contractor.

END OF SECTION 281600

SECTION 282300 - VIDEO SURVEILLANCE

1.1 SUMMARY

- A. Video surveillance system consisting of cameras, data transmission wiring, and a control station.
- B. System is integrated with monitoring and control system.

1.2 QUALITY ASSURANCE

- A. Quality Standard for Installation: NECA 1.
- B. Electronic Data Exchange: Comply with SIA TVAC.

1.3 WARRANTY

- A. Cameras and Equipment: One year.

1.4 MATERIALS

- A. Color Camera: CCD interline transfer, 380,000 771(H) by 492(V) pixels.
- B. Automatic Color Dome Camera: Dome assembly with color camera, motorized pan and tilt, zoom lens, and receiver/driver.
 - 1. Pan and Tilt: Controlled by operator, with 8 user-definable scenes, each allowing 16-character titles.
- C. Lenses: Optical-quality coated optics, designed specifically for video surveillance applications, and matched to specified camera. Provide color-corrected lenses with color cameras.
- D. Camera-Supporting Equipment: Rated for the total weight supported times a safety factor of two.
 - 1. Protective Housings for Cameras: Steel[or 6061 T6 aluminum] enclosures.
 - 2. Enclosure Rating: NEMA 250, Type 3R, IEC 60529, IP 52.
- E. Monitors: Color.
 - 1. Metal cabinet units designed for continuous operation.
 - 2. Screen Size (Diagonal Dimension): 20".
 - 3. Horizontal Resolution: 600 lines, minimum, at center.
- F. Digital Video Recorders: Digital, time-lapse type, full frame and motion.

- G. Video Switchers.
 - 1. Quad Switch: For displaying images from four cameras on a single monitor.
 - 2. Manual Switch Bank: Low-loss, high-isolation, multiple-video switch to allow manual switching of multiple quad switches and cameras to a single output.
 - 3. Sequential Switchers: Automatically sequence outputs of multiple cameras to single monitor and videotape recorder.
 - 4. Pan-Tilt-Zoom Controls: Arranged for multiple-camera control, with switches to select camera to be controlled.

- H. Video Motion Sensors (Interior): Detect changes in video signal within a user-defined protected zone. Video inputs shall be composite video as defined in SMPTE 170.

- I. Control Stations: Freestanding, modular metal furniture units.
 - 1. Equipment Mounting: Standard 19-inch rack complying with EIA 310.
 - 2. Power Continuity for Control Station: Rechargeable, valve-regulated, recombinant, sealed, lead-acid batteries in power supplies of central-station control units and individual system components to maintain continuous system operation during outages of both normal and backup ac system supply.

- J. Signal Transmission Components: 75-ohms coaxial cable with BNC connectors (Plenum rated).

1.5 INSTALLATION

- A. Wiring Method: In raceways.

1.6 FIELD QUALITY CONTROL

- A. Testing: Contractor to align and adjust system and components, verify operation of components, set and name preset positions, and connect and verify responses to alarms.

END OF SECTION 282300

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

1.1 SUMMARY

- A. System Description: Noncoded, UL-certified addressable system with automatic sensitivity control of certain smoke detectors; multiplexed signal transmission, dedicated to fire-alarm service only.

1.2 QUALITY ASSURANCE

- A. Quality Standard: NFPA 72.
- B. Installer Qualifications: Certified by NICET as fire-alarm Level II technician.

1.3 SYSTEMS OPERATIONAL DESCRIPTION

- A. Signal initiation from:
 - 1. Manual stations.
 - 2. Heat detectors.
 - 3. Smoke detectors.
 - 4. Duct smoke detectors.
 - 5. Verified automatic alarm operation of smoke detectors.
 - 6. Automatic sprinkler system water flow.
 - 7. Heat detectors in elevator shaft and pit.
 - 8. Fire-extinguishing system operation.
 - 9. Fire standpipe system water flow.
- B. Signal initiates the following actions:
 - 1. Continuously operate alarm notification appliances.
 - 2. Identify alarm at the fire-alarm control unit and remote annunciators.
 - 3. Transmit an alarm signal to the remote alarm receiving station.
 - 4. Unlock electric door locks in designated egress paths.
 - 5. Release fire and smoke doors held open by magnetic door holders.
 - 6. Activate voice/alarm communication system.
 - 7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
 - 8. Activate smoke-control system (smoke management) at firefighter smoke-control system panel.
 - 9. Activate stairwell and elevator shaft pressurization systems.
 - 10. Close smoke dampers in air ducts of designated air conditioning duct systems.
 - 11. Recall elevators to recall floors.
 - 12. Activate emergency lighting control.
 - 13. Activate emergency shutoffs for gas and fuel supplies.
 - 14. Record events in the system memory.

15. Record events by the system printer.
- C. Supervisory signal initiation by:
1. Valve supervisory switch.
 2. Low-air-pressure switch of a dry-pipe sprinkler system.
 3. Elevator shunt-trip supervision.
- D. Trouble signal initiation by:
1. Open circuits, shorts, and grounds, in designated circuits.
 2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
 3. Loss of primary power at fire-alarm control unit.
 4. Ground or a single break in fire-alarm control unit internal circuits.
 5. Abnormal ac voltage at the fire-alarm control unit.
 6. Break in standby battery circuitry.
 7. Failure of battery charging.
 8. Abnormal position of any switch at the fire-alarm control unit or annunciator.
 9. Fire-pump power failure, including a dead-phase or phase-reversal condition.
 10. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system.
- E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.

1.4 PRODUCTS

- A. Fire-Alarm Control Unit: Modular, power-limited design with electronic modules, addressable initiation devices.
1. Alphanumeric liquid-crystal display with 2 line(s) of 80 characters and system controls and keypad.
 2. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.
 - a. Initiating Device Circuits: Comply with NFPA 72.
 - b. Notification Appliance Circuits: Style Z.
 - c. Signaling Line Circuits: Comply with NFPA 72.
- B. Manual Fire-Alarm Boxes: Double action.
- C. System Smoke Detectors: Base mounted, self-restoring, with integral visual-indicating light and remote controllability from fire-alarm control unit.
- D. Heat Detectors: Combination type.
- E. Notification Appliances:

1. Horns: Electric-vibrating-polarized type, 24-V dc.
2. Visual Alarm Devices: Xenon strobe lights.
3. Voice/Tone Speakers: Flush mounted.

F. Magnetic Door Holders: Wall- or floor-mounted units; 24-V ac or dc.

G. Remote Annunciator: Alphanumeric display same as fire-alarm control unit.

H. Addressable Interface Device: Microelectronic monitor module with integral relay to initiate elevator recall and shut down power.

I. Digital Alarm Communicator Transmitter: For transmission of fire-alarm, supervisory, and trouble signals to a remote alarm receiving station or another remote location by means of telephone lines.

1.5 FIELD QUALITY CONTROL

A. Testing: By Contractor.

END OF SECTION 283111

SECTION 311000 - SITE CLEARING

1.1 SUMMARY

- A. Protecting existing vegetation to remain.
- B. Removing existing vegetation.
- C. Clearing and grubbing obstructions and vegetation including removing roots and debris.
- D. Stripping and stockpiling topsoil and stockpiling surplus topsoil.
- E. Providing temporary erosion and sedimentation control measures.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

1.1 SUMMARY

- A. Preparing subgrades for slabs-on-grade, walks, pavements, lawns and grasses and exterior plants.
- B. Dewatering to protect excavated subgrades.
- C. Excavating and backfilling or filling for buildings and structures, including footings and foundations, underground tanks, basins, and mechanical or electrical utility structures.
- D. Excavating and backfilling for utility trenches.
- E. Excavation: Unclassified.
- F. Grading.
- G. Subsurface drainage backfill for walls.
- H. Subbase course for concrete walks and pavements.
- I. Subbase and base course for hot-mix asphalt pavement.
- J. Drainage course for cast-in-place concrete slabs-on-grade.

1.2 MATERIALS

- A. Soil Materials:
 - 1. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GM, GP-GM, GW-GM, SM, SW. Maximum percentage passing #200 Sieve: 15%.
 - 2. Unsatisfactory Soils: ASTM D 2487 soil classification groups SC, SP, GP, CL, CH, PT, OH, OL, ML, MH.
 - 3. Backfill and Fill: Satisfactory soil materials.
 - 4. Subbase and Base Course: Natural or crushed gravel, crushed stone, and natural or crushed sand.
 - 5. Engineered Fill: Natural or crushed gravel, crushed stone, and natural or crushed sand.
 - 6. Bedding Course: Natural or crushed gravel, crushed stone, and natural or crushed sand.
 - 7. Drainage Course: Crushed stone, or crushed or uncrushed gravel.
- B. Geotextiles: Subsurface drainage geotextile.
- C. Geogrid: Subsurface stabilization grid.
- D. Warning Tape: Detectable polyethylene film.

1.3 EXCAVATION

- A. Explosives: Not permitted.
- B. Disposal of Surplus and Waste Materials: Off Owner's property.

1.4 FIELD QUALITY CONTROL

- A. Geotechnical Testing Agency: Owner engaged.

END OF SECTION 312000

SECTION 312319 - DEWATERING

1.1 PERFORMANCE REQUIREMENTS

- A. Contractor to design dewatering system.

1.2 PROJECT CONDITIONS

- A. Geotechnical report is available.
- B. Contractor to engage a surveyor or engineer to survey adjacent existing structures and site improvements before and regularly during dewatering.
- C. Adhere to Storm Water Pollution Prevention Plan or equivalent for treatment of all nuisance water.

1.3 INSTALLATION

- A. Maintain water level 24 inches below surface of excavation.

END OF SECTION 312319

SECTION 312500 - EROSION AND SEDIMENTATION CONTROLS

1.1 SUMMARY

- A. Erosion control and slope protection facilities including blankets, fences, mulches, and dikes.
- B. Construction of drainage facilities to protect work areas.
- C. Temporary gravel driveway at the primary construction access to the site.
- D. Prepare Erosion Control Plans and Storm Water Pollution Prevention Plan and obtain State of Utah permits.
- E. Fugitive Dust Plan.

1.2 PRODUCTS

- A. Blankets and Mats: Biodegradable fabrics.
- B. Geotextiles and Geosynthetics: Filter fabrics, silt fences and soil stabilization products.
- C. Seed and Mulch: Hydromulch with an annual rye grass seed mix of three varieties.
- D. Gravel: 2-3 inch stone.

1.3 INSTALLATION

- A. Comply with government requirements for erosion and sedimentation controls.

END OF SECTION 312500

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

1.1 PERFORMANCE REQUIREMENTS

- A. Contractor to design excavation support and protection system.

1.2 PROJECT CONDITIONS

- A. Geotechnical report is available.

END OF SECTION 315000

SECTION 321216 - ASPHALT PAVING

1.1 SUMMARY

- A. Hot-mix asphalt paving.
- B. Pavement-marking paint.

1.2 QUALITY ASSURANCE

- A. Regulatory Requirements: Per UDOT and the DFCM Design Requirements section of the Design Manual dated May 15, 2006.

1.3 MATERIALS

A. Asphalt Materials:

- 1. Asphalt Binder: AASHTO M 320.
- 2. Asphalt Cement: ASTM D3381; viscosity AC 10 for moderate climates.
- 3. Prime Coat: Medium-curing cutback asphalt.
- 4. Tack Coat: Emulsified asphalt or cationic emulsified asphalt.

B. Auxiliary Materials:

- 1. Pavement-Marking Paint: State of Utah #780.
- 2. Wheel Stops: Precast concrete with galvanized-steel dowels.

C. Asphalt Mixes:

- 1. Untreated Base Course: 1-inch gradation complying with DFCM requirements.

Untreated Base Course	
Size	% by Weight Paving Sieve
1"	100
1/2 "	70 to 100
#4	41 to 68
#16	21 to 41
#50	10 to 27
#200	4 to 13

2. Surface Course (asphalt): 1/2-inch gradation complying with DFCM requirements.

Surface Course (asphalt)	
Size	% by Weight Paving Sieve
1/2 "	100
3/8 "	70 to 100
#4	50 to 78
#16	30 to 48
#50	18 to 31
#200	7 to 13

1.4 INSTALLATION

A. Hot-Mix Asphalt Paving:

1. Proof-roll subgrade at locations receiving full-depth asphalt pavement.
2. Base Course: 10 inches complying with DFCM requirements.
3. Surface Course: 3 inches (parking), or 4 inches (roadways), as recommended in geotechnical report, and complying with DFCM requirements whichever is more stringent.

1.5 FIELD QUALITY CONTROL

A. Testing: By owner.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

1.1 SUMMARY

- A. Curbs and gutters.
- B. Walkways.

1.2 QUALITY ASSURANCE

- A. Design mixture for concrete.
- B. Quality Standard: ACI 301, "Specification for Structural Concrete."

1.3 MATERIALS

- A. Reinforcement:
 - 1. Reinforcing Bars and Tie Bars: Deformed steel.
- B. Concrete:
 - 1. Portland Cement: ASTM C 150.
 - 2. Aggregate: Normal-weight aggregate.
 - 3. Admixture: Air entraining.
 - 4. Compressive Strength: 4000 psi at 28 days for non-traffic loaded concrete, 5000 psi at 28 days for traffic loaded concrete pavement.
- C. Membrane-Forming Curing Compound: ASTM C309, Type I, liquid membrane.
- D. Related Materials:
 - 1. Expansion- and Isolation-Joint-Filler Strips: Cellulosic fiber.

1.4 FINISHING

- A. Finishes: Medium-textured broom finish.

1.5 FIELD QUALITY CONTROL

- A. Testing: By Owner-engaged agency.

END OF SECTION 321313

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

1.1 SUMMARY

- A. Expansion and contraction joints within cement concrete pavement.
- B. Joints between cement concrete and asphalt pavement.

1.2 QUALITY ASSURANCE

- A. Preconstruction compatibility and adhesion testing.
- B. Product testing.

1.3 MATERIALS

- A. Cold-Applied Joint Sealants:
 - 1. Type SL Silicone Sealant for Concrete and Asphalt: Multi-component, self-leveling formulation.
- B. Joint-Sealant Backer Materials: Round backer rods.

END OF SECTION 321373

SECTION 328400 - IRRIGATION SYSTEMS

1.1 SUMMARY

- A. Piping, valves, sprinklers, specialties, controls, and wiring for automatic-control irrigation system.

1.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working-Pressure Ratings:
 - 1. Irrigation Main Piping: 200 psig.
 - 2. Circuit Piping: 150 psig.
 - 3. Drain Piping: 100 psig.

1.3 MATERIALS

- A. Control-Valve Boxes: Plastic.
- B. Piping Specialties: Water regulators, water hammer arresters, and pressure gages.
- C. Sprinklers:
 - 1. Flush surface.
 - 2. Bubbler.
 - 3. Shrubbery.
 - 4. Pop-up spray.
 - 5. Pop-up, rotary spray.
 - 6. Pop-up, rotary impact.
- D. Sprinkler Specialties: Pressure gages, application pressure regulators, strainer/filter units, emitters, and drip tubes.
- E. Automatic-Control System: 24-V ac; with interior control enclosures, transformer, controller stations for automatic control valves, timing device, and wiring.

1.4 INSTALLATION

- A. Underground Irrigation Main Piping Applications:
 - 1. NPS 4 and Smaller: Schedule 40 PVC pipe.
 - 2. NPS 5 and Larger: Schedule 40 PVC pipe.
- B. Circuit Piping Applications:
 - 1. NPS 2 and Smaller: Schedule 40 PVC pipe.

2. NPS 2-1/2 to NPS 4: Class 40 PVC pipe.
- C. Underground Branch and Offset Piping Applications:
1. NPS 2 and Smaller: Schedule 40 PVC pipe.
 2. NPS 2-1/2 to NPS 4: Class 200 PVC pipe.
- D. Risers to Aboveground Sprinklers and Specialties: Schedule 80 PVC pipe.
- E. Drain Piping Applications: Schedule 80 PVC pipe.
- F. Valve Applications:
1. Underground, Shutoff-Duty Valves: Gate valve.
 2. Underground, Manual Control Valves: Bronze globe valve.
 3. Control Valves: Plastic diaphragm valve.
 4. Drain Valves: Bronze ball valve.

END OF SECTION 328400

SECTION 329200 - LAWNS AND GRASSES

1.1 SUMMARY

- A. Sodded lawns.

1.2 QUALITY ASSURANCES

- A. Topsoil analysis of existing and imported topsoil.

1.3 MAINTENANCE SERVICE

- A. Lawns: 30 days.
- B. Meadows: 40 days.

1.4 MATERIALS

- A. Turfgrass Sod: Kentucky Blue Grass.
- B. Topsoil: Import topsoil or manufacture topsoil off site.
- C. Organic Soil Amendments: Minimum 4%.
- D. Fertilizers: Commercial slow-release fertilizer.
- E. Planting Soil Mix: Topsoil with organic soil amendments.

1.5 INSTALLATION

- A. Planting Soil Mix Depth for Newly Graded Subgrades: 4 inches.

END OF SECTION 329200

SECTION 329300 - EXTERIOR PLANTS

1.1 SUMMARY

- A. Layout, soil preparation, bed establishment, excavation for and planting of trees, shrubs, ground covers and plants.
- B. Edgings.
- C. Planters.

1.2 QUALITY ASSURANCE

- A. Topsoil analysis of existing and imported topsoil.

1.3 WARRANTY

- A. Trees and Shrubs: One year.
- B. Ground Cover and Plants: Three months.

1.4 MAINTENANCE SERVICE

- A. Trees and Shrubs: Until acceptance.
- B. Ground Cover and Plants: Until acceptance.

1.5 MATERIALS

- A. Shade and Flowering Trees: ANSI Z60.1, nursery grown.
 - 1. Shade Trees: Balled and burlapped.
 - 2. Small Trees: Balled and burlapped.
- B. Deciduous Shrubs: ANSI Z60.1, nursery grown; container grown.
- C. Coniferous Evergreens: ANSI Z60.1, nursery grown, normal quality; balled and burlapped and container grown.
- D. Broadleaf Evergreens: ANSI Z60.1, nursery grown, normal quality; balled and burlapped and container grown.
- E. Ground Cover Plants: ANSI Z60.1, nursery grown; container grown.
- F. Plants: ANSI Z60.1, nursery-grown annuals, perennials and fast-growing vines.

- G. Topsoil: Import topsoil or manufacture topsoil off site, amended to 4% organic matter, minimum.
- H. Fertilizers: Commercial fertilizer and slow-release fertilizer.
- I. Mulches: Organic.
- J. Landscape Edgings.
- K. Planting soil mix includes topsoil with organic soil amendments.

1.6 INSTALLATION

- A. Planting Soil Mix Depth for Planting Beds: 12 inches.

END OF SECTION 329300

SECTION 331113 - WATER DISTRIBUTION

1.1 SUMMARY

- A. For combined culinary water services and fire-service mains outside the building.

1.2 SUBMITTALS

- A. Coordination Drawings and Materials.

1.3 QUALITY ASSURANCE

- A. Quality Standard for Electrical Components, Devices, and Accessories: NFPA 70.
- B. Quality Standard for Materials, Installations, Tests, Flushing, and Valve and Hydrant Supervision for Fire-Service-Main Piping: NFPA 24.
- C. Quality Standard for Plastic Potable-Water-Service Piping: NSF 14
- D. Quality Standard for Water-Service Piping and Specialties for Domestic Water: NSF 61.
- E. Quality Standard for Fire-Service-Main Products: FMG's "Approval Guide."

1.4 MATERIALS

- A. Underground Water-Service Piping ½" to 3" Diameter.
 - 1. Soft copper tube and copper fittings.
 - 2. PE pipe and insert fittings.
 - 3. PE pipe and PE molded heat-fusion fittings.
 - 4. PVC, Schedule 80 pipe and PVC Schedule 80 socket fittings.
- B. Underground Water-Service 4" to 12" Diameter:
 - 1. Ductile-iron pipe and fittings.
- C. Underground Fire-Service-Main Piping:
 - 1. Ductile-iron pipe and fittings.
- D. Aboveground and Vault Fire-Service Main Piping: Ductile-iron, grooved-end pipe and ductile-iron-pipe appurtenances.
- E. Underground Combined Water-Service and Fire-Service-Main Piping:

1. Ductile-iron pipe and fittings.
 2. Ductile-iron, grooved-end pipe and ductile-iron-pipe appurtenances.
 3. PVC, AWWA Class 200 pipe listed for fire-protection service.
 4. Fiberglass, AWWA, FMG-approved RTRP, Class 200 and RTRF.
- F. Aboveground Combined Water-Service and Fire-Service-Main Piping: Ductile-iron, grooved-end pipe and ductile-iron-pipe appurtenances.
- G. Special Pipe Fittings: Ductile-iron with rigid expansion joints on flexible expansion joints.
- H. Piping Specialties:
1. Transition fittings.
 2. Tubular-sleeve pipe couplings.
 3. Split-sleeve pipe couplings.
 4. Flexible connectors.
 5. Dielectric fittings.
- I. Corrosion-Protection Piping Encasement: Required.

1.5 MANUFACTURED UNITS

- A. Gate Valves:
1. Cast Iron: Nonrising stem C509, 200 psig.
 2. UL/FMG, Cast Iron: Nonrising stem.
- B. Check Valves: AWWA, UL/FMG, 250 psig.
- C. Butterfly Valves: AWWA
- D. Water Meters: (Provided by City unless otherwise noted.)
- E. Pressure-Reducing Valves: Water control valves.
- F. Relief Valves: Air-release
- G. Backflow Preventers:
1. Reduced-pressure-principle backflow preventers.
 2. Double-check, backflow-prevention assemblies.
 3. Reduced-pressure-detector, fire-protection backflow preventer assemblies.
 4. Double-check, detector-assembly backflow preventers.
 5. Backflow preventer test kits.
- H. Water Meter Boxes: Concrete vault.
- I. Concrete Vaults: Required.

- J. Protective Enclosures: Freeze protection, Class I-V
- K. Fire Hydrants:
 - 1. Dry barrel, AWWA, 150 psig minimum.

END OF SECTION 331113

SECTION 330500 - COMMON WORK RESULTS FOR UTILITIES

1.1 SUMMARY

- A. System Description: Piped utilities outside the building.

1.2 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: AWS D1.1/D1.1M.
- B. Steel Piping Welding Qualifications: ASME Boiler and Pressure Vessel Code: Section IX.
- C. Lettering and Colors of Identification Devices: ASME A13.1.

1.3 MATERIALS

- A. Transition Fittings:
 - 1. Transition couplings.
 - 2. Transition fittings.
 - 3. Transition unions.
 - 4. Flexible transition couplings.
- B. Dielectric Fittings:
 - 1. Dielectric unions.
 - 2. Dielectric flanges.
 - 3. Dielectric-flange kits.
 - 4. Dielectric couplings.
 - 5. Dielectric nipples.
- C. Sleeves:
 - 1. Galvanized-steel sheet.
 - 2. Steel pipe.
 - 3. Cast iron.
 - 4. Molded PVC.
 - 5. PVC pipe.
 - 6. Molded PE.
- D. Identification Devices:
 - 1. Equipment nameplates.
 - 2. Stencils.
 - 3. Snap-on plastic pipe markers.
 - 4. Pressure-sensitive pipe markers.

5. Plastic tape.
 6. Valve tags.
 7. Engraved plastic-laminate signs.
 8. Plastic equipment markers.
 9. Plasticized tags.
- E. Grout: Nonshrink; nonmetallic.
- F. Flowable Fill: Low-strength concrete, flowable-slurry mix.

END OF SECTION 330500

SECTION 331313 - SANITARY SEWERAGE

1.1 SUMMARY

- A. Gravity-flow, nonpressure sanitary sewerage outside the building.

1.2 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water.

1.3 COMPONENTS

- A. Cleanouts: PVC
- B. Manholes: Standard precast concrete.
 - 1. Resilient pipe connectors.
 - 2. Reinforced-concrete grade rings.
 - 3. Protective coating.
 - 4. Manhole frames and covers.
 - 5. Manhole cover inserts.

1.4 INSTALLATION

- A. Gravity-Flow, Nonpressure Sewer Piping Applications:
 - 1. NPS 3: PVC sewer pipe.
 - 2. NPS 4: PVC sewer pipe.
 - 3. NPS 5 and NPS 6: PVC sewer pipe.
 - 4. NPS 8 and NPS 10: PVC sewer pipe.
 - 5. NPS 12 and NPS 15: PVC sewer pipe.
 - 6. NPS 18 to NPS 24: PVC sewer pipe.

END OF SECTION 331313

SECTION 334100 - NATURAL GAS DISTRIBUTION

1.1 SUMMARY

- A. Natural gas piping outside the building.

1.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working-Pressure Ratings:
 - 1. Piping and Valves: 100 psig minimum, unless otherwise indicated.
 - 2. Service Regulators: 100 psig minimum, unless otherwise indicated.
 - 3. Service Meters: 65 psig.

1.3 QUALITY ASSURANCE

- A. Quality Standard: ANSI Z223.1 or NFPA 54.

1.4 MATERIALS

- A. Steel Pipe: Schedule 40.
- B. PE pipe and socket fittings.
- C. Service-line risers.
- D. Shutoff Valves:
 - 1. Nonlubricated, tapered plug valves.
 - 2. Lubricated, tapered plug valves.
 - 3. Ball valves.
 - 4. Lubricated plug valves.
 - 5. Nonlubricated plug valves.
 - 6. PE valves.
- E. Valve boxes.
- F. Earthquake, automatic-shutoff valves.
- G. Service Regulators: Single-stage, steel jacketed.
- H. Service Meters: Furnished by gas utility.
- I. Concrete bases.

1.5 INSTALLATION

A. Aboveground Piping:

1. NPS 2 and Smaller: Steel pipe and malleable-iron fittings with threaded joints.
2. NPS 2-1/2 and Larger: Steel pipe and fittings with welded joints.

B. Underground Piping: PE pipe and fittings with heat-fusion joints.

C. Connection to Existing Gas Main: By gas utility.

END OF SECTION 334100

SECTION 335100 - NATURAL GAS DISTRIBUTION

1.1 SUMMARY

- A. Natural gas piping outside the building.

1.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working-Pressure Ratings:
 - 1. Piping and Valves: 100 psig minimum, unless otherwise indicated.
 - 2. Service Regulators: 100 psig minimum, unless otherwise indicated.
 - 3. Service Meters: 65 psig.

1.3 QUALITY ASSURANCE

- A. Quality Standard: ANSI Z223.1 or NFPA 54.

1.4 MATERIALS

- A. Steel Pipe: Schedule 40.
- B. PE pipe and socket fittings.
- C. Service-line risers.
- D. Shutoff Valves:
 - 1. Nonlubricated, tapered plug valves.
 - 2. Lubricated, tapered plug valves.
 - 3. Ball valves.
 - 4. Lubricated plug valves.
 - 5. Nonlubricated plug valves.
 - 6. PE valves.
- E. Valve boxes.
- F. Earthquake, automatic-shutoff valves.
- G. Service Regulators: Single-stage, steel jacketed.
- H. Service Meters: Furnished by gas utility.
- I. Concrete bases.

1.5 INSTALLATION

A. Aboveground Piping:

1. NPS 2 and Smaller: Steel pipe and malleable-iron fittings with threaded joints.
2. NPS 2-1/2 and Larger: Steel pipe and fittings with welded joints.

B. Underground Piping: PE pipe and fittings with heat-fusion joints.

C. Connection to Existing Gas Main: By gas utility.

END OF SECTION 335100