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INVITATION FOR BIDS

FOR

**ORANGE COUNTY CONVENTION CENTER WEST BUILDING HALL "A" NATURAL
GAS RETROFIT**

**PART H
TECHNICAL SPECIFICATIONS**

**PART H
Volume II**

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SPECIFICATIONS

FOR

OCCC - WEST BUILDING, HALL "A" NATURAL GAS RETROFIT



**Orange
County
Convention
Center**

**HANSON No. 17G0189
November 30, 2018**

100% Submittal

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SECTION 000115 - LIST OF DRAWING SHEETS

PART 1 - GENERAL

1.1 LIST OF DRAWINGS

A. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

G-001	COVER SHEET
P-001	PLUMBING LEGEND
P-400	LEVEL 4 OVERALL PLAN - PLUMBING
P-407A	PARTIAL LEVEL 4 PLAN - AREA 7A - PLUMBING
P-407D	PARTIAL LEVEL 4 PLAN - AREA 7D - PLUMBING
P-408A	PARTIAL LEVEL 4 PLAN - AREA 8A - PLUMBING
P-408B	PARTIAL LEVEL 4 PLAN - AREA 8B - PLUMBING
P-408C	PARTIAL LEVEL 4 PLAN - AREA 8C - PLUMBING
P-408D	PARTIAL LEVEL 4 PLAN - AREA 8D - PLUMBING
P-411A	PARTIAL LEVEL 4 PLAN - AREA 11A - PLUMBING
P-411B	PARTIAL LEVEL 4 PLAN - AREA 11B - PLUMBING
P-411C	PARTIAL LEVEL 4 PLAN - AREA 11C - PLUMBING
P-411D	PARTIAL LEVEL 4 PLAN - AREA 11D - PLUMBING
P-412A	PARTIAL LEVEL 4 PLAN - AREA 12A - PLUMBING
P-412D	PARTIAL LEVEL 4 PLAN - AREA 12D - PLUMBING
P-801	PLUMBING - NATURAL GAS ISOMETRIC
P-901	PLUMBING DETAILS
E-001	GENERAL ELECTRICAL NOTES, LEGEND AND ABBREVIATIONS
E-102	ELECTRICAL OVERALL FLOOR PLAN - LEVEL 2
E-104	ELECTRICAL OVERALL FLOOR PLAN - LEVEL 4
E-207A	PARTIAL LEVEL 2 - AREA 7A - POWER
E-207D	PARTIAL LEVEL 2 - AREA 7D - POWER
E-209B	PARTIAL LEVEL 2 - AREA 9B - POWER
E-209C	PARTIAL LEVEL 2 - AREA 9C - POWER
E-210B	PARTIAL LEVEL 2 - AREA 10B - POWER
E-210C	PARTIAL LEVEL 2 - AREA 10C - POWER
E-212A	PARTIAL LEVEL 2 - AREA 12A - POWER
E-212D	PARTIAL LEVEL 2 - AREA 12D - POWER
E-407A	PARTIAL LEVEL 4 - AREA 7A - POWER
E-407D	PARTIAL LEVEL 4 - AREA 7D - POWER
E-412A	PARTIAL LEVEL 4 - AREA 12A - POWER
E-412D	PARTIAL LEVEL 4 - AREA 12D - POWER
E-601	PANEL SCHEDULES AND DETAILS

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 000115

SECTION 010100 - SUMMARY OF WORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 PROJECT DESCRIPTION

- A. Performance of all tasks specified in the contract documents shall be the responsibility of the contractor unless specified otherwise.

1.03 SCOPE OF WORK

- A. Summary of Work:
- Plumbing scope includes the retrofit of natural gas piping within the West Building "A" hall catwalks to serve the needs on the exhibit floor below during shows and conventions. Piping shall connect to the existing natural gas piping terminating at the end of "B" hall and be extended into "A" hall. Piping shall include electric solenoid valves for automatic gas supply shutoff via emergency push buttons located at the exhibit floor.
 - Electrical scope includes new 120v wiring for the natural gas piping electronic valves and emergency shut-off push buttons.

1.04 CONTRACTOR RESPONSIBILITIES

- A. The contractor shall have all submittals approved by the Engineer and accepted by the Owner prior to the start of active construction.
- B. The contractor shall have all equipment and material onsite prior to the start of active construction.
- C. The contractor shall submit to the Owner prior to the project pre-construction meeting the following:
- Preliminary Schedule of Values
 - Construction Schedule
 - Submittal Schedule
 - Emergency Telephone List including subcontractors and suppliers
- D. The contractor shall field verify existing conditions of construction prior to start of active construction.

1.05 WORK UNDER OTHER CONTRACTS

- A. Separate contracts may be issued to perform certain construction operations at the site. The contractor of this project will allow reasonable access and coordination to the other contractor/s.

1.06 WORK SEQUENCE

- A. Portions of the facility shall remain occupied and operational while work is in progress. The facility shall remain occupied and operational while work is in progress. All work shall be fully coordinated in writing with Orange County Convention Center Project Manager prior to commencement of work. Material and equipment deliveries shall be made during normal business hours.
- B. The contractor may work on the weekends at his or her discretion with prior written approval from Orange County Convention Center Project Manager. Weekend work shall not be an additional cost to the Owner. The contractor will coordinate with the Orange County Convention Center Project Manager for access to the building on weekends and after hours work.
- C. Orange County Convention Center Project Manager shall direct contractor on which days and hours are acceptable for work.

1.07 CONTRACTOR USE OF PREMISES

- A. General: During the construction period, the Contractor shall have limited use of the premises for construction operations, including use of the site. The Contractor shall coordinate which areas are acceptable to Orange County Convention Center Staff for use during the life of the project. The Contractor's use of the premises is limited only by the Owner's right to perform construction operations with its own forces or to employ separate contractors on portion of the project.
- A. General: Limited use of the premises to construction activities in areas indicated within the limit of the premises. The Contractor may use any portion(s) of the site for storage or work areas only with prior approval from Orange County Convention Center Project Manager.
 - 1. Confine operations to areas within Contract limits indicated on the Drawings. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
 - 2. Keep driveways and entrances serving the premises clear and available to the Owner and the Owners' employees at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.
 - 3. Burial of Waste Materials: Do not dispose of organic and hazardous material on site, either by burial or by burning.
 - 4. Comply with Owner's requirements for ingress and egress procedures, prohibitions against firearms, procedures for transportation of workers, safety and fire

prevention requirements, and all applicable pollution control requirements. Refer to the following reference documents:

- a. Orange County Safety and Health Manual
 - b. Orange County Policy Manual (pg. 100 regarding firearms)
5. Require all employees and subcontractors to wear no-objectionable clothing; prohibit revealing clothing and articles of clothing with offensive writing displayed. Remove from premises all personnel until such clothing is changed.
 6. All personnel shall abide by the Orange County Tobacco Free policy while on any Orange County property. Policy applies to buildings, parking lots, parks, break areas, and work sites. Tobacco products are defined as cigars, cigarettes, pipes, e-cigs, chewing tobacco and snuff. Failure to abide by the policy may result in civil penalties levied under Chapter 386, Florida Statutes and Contract enforcement remedies.

1.08 DISTRIBUTION OF RELATED DOCUMENTS

- A. The Contractor is solely responsible for the distribution of ALL related documents/drawings to ALL appropriate vendors/subcontractors to ensure proper coordination of all aspects of the project and its related parts during bidding and construction.

1.09 CONTRACT DOCUMENT FILE

- A. Copies of the Contract Documents, Plans, Specifications, Addenda, Change Orders, Engineers Supplemental Instructions, approved Shop Drawings, Substitution Acceptances, etc. shall be placed and maintained at the project site by the Contractor throughout the entire contract period. These said documents shall be filed in a manner that allows for ease of retrieval. Documents shall be made available to the Engineer and the County's representatives throughout this same period.

1.10 SECURITY AND IDENTIFICATION

- A. All costs for background investigations will be the Contractor's responsibility. The County shall have the right to request any additional investigative background information including, but not limited to, employment records, Right-to Know records, E-verify system records (If the contractor uses this service as a means to determine employee eligibility), training records, payroll records, position for which hired including site location of any personnel assigned to perform the services. Furnish, in writing, all such information to the extent allowed by law, prior to commencement of services. The County reserves the right to conduct its own investigation of any employee or subcontractor of the Contractor.
- B. Background Checks for the Contractor's staff must be approved by Orange County's security team prior to working in any County facility. Obtain necessary forms for background checks for work at Orange County. All Contractor's staff background checks will be sent to the Orange County project Manager for approval.

- C. For security purposes and to maintain privacy, please submit a FDLE Background Checks via email. The subject line of the email must contain the following ***EXEMPT***
- D. The Orange County Convention Center will inform the Contractor of their Background Check results. Upon Background Check approval, the contractor's staff shall arrange an appointment with the Orange County Convention Center staff to obtain an Orange County ID Badge. An Affidavit of Identity form (Issued by Contractor) and a State of Florida ID or Driver's License will be required.
- E. Contractor's employees will not be allowed in Orange County facilities without completed and approved background investigations.

1.11 BUILDING/SITE SECURITY REQUIREMENTS

- A. Provide security for each and every day that work is being performed on Site. The security firm that will be used is:

G4S Security Systems (USA), Inc.
Contact: Jose Troche, MBA
Phone: 407 207 3221
Jose.troche@usa.g4s.com

1.12 OWNER OCCUPANCY

- A. The Owner will occupy the building and areas next to the Work area. Normal hours are 7:00 AM to 5:00 PM Monday thru Friday. Coordinate with the Owner's representative for Work areas that can be performed on during normal work hours. Work can be performed after hours provided the area where Work is done is fully operational and back in original condition prior to beginning the next business day. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.
 - 1. A certificate of Substantial Completion will be executed for each specific portion of the Work to be occupied prior to Owner occupancy
 - 2. Obtain a Certificate of Occupancy from the local building officials prior to Owner occupancy.
 - 3. Prior to partial occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will provide operation and maintenance of mechanical and electrical systems in occupied portions of the building.

PART 2 PRODUCTS

2.01 ASBESTOS FREE MATERIAL

- A. Contractor shall provide a written and notarized statement on company letterhead(s) to certify and warrant that ONLY ASBESTOS FREE MATERIALS AND PRODUCTS were provided as required by the Engineer. Such statement shall be submitted with the final

payment request. Final payment shall not be made until such statement is submitted. Contractor agrees that if materials containing asbestos are subsequently discovered at any future time to have been included in the construction, the Contractor shall be liable for all costs related to the redesign or modification of the construction of the project so that materials containing asbestos are removed from the facility. If construction has begun or has been completed pursuant to a design that includes asbestos containing materials, the Contractor shall also be liable for all costs related to the abatement of such asbestos.

PART 3 EXECUTION (Not applicable).

END OF SECTION 010100

SECTION 010270 - APPLICATION FOR PAYMENT

PART I GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.
- B. The Contractor's Construction Schedule and Submittal Schedule are included in Section 013000 – SUBMITTALS.

1.03 SCHEDULE OF VALUES

- A. Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Submit the Schedule of Values to the Owner at the earliest feasible date, but in no case later than Preconstruction Meeting. Refer to Section 012000.
 - 2. Sub-Schedules: Where the Work is separated into phases that require separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.
 - 1. Identification: Include the following project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of the Engineer
 - c. Project Number
 - d. Contractor's name and address
 - e. Date of submittal
 - 2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
 - a. Generic name
 - b. Related Specification Section

- c. Change Orders (numbers) that have affected value
 - d. Dollar Value
 - e. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent
3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal sub-contract amounts down into several line items:
 - a. A value will be given for at least every major specification section (sub-sections can logically be grouped together).
 - b. A single material subcontractor (i.e. sod, window blinds) will not be required to be broken down into labor and material unless it is anticipated the materials will be stored and invoiced prior to installation.
 - c. All multiple item subcontracts or work items (i.e. concrete, roofing, painting, mechanical, electrical items, etc.) will be shown broken down at least in labor and material (all taxes, burden and overhead and profit included).
 - d. Mobilization (move-on, bond, insurance, temporary office and sanitary service installation) shall not exceed 2 1/2% of contract price.
 - e. For multi-story work all items broken down per floor.
 - f. Concrete broken down at least into foundation slab on grade, columns, beams and suspended slabs.
 - h. Plumbing broken down at least into underslab rough-in, vents and stacks supply piping, equipment items (each listed separately), fixtures and trim.
 - j. Electrical: same as HVAC.
 - l. Logical grouping of specification subsections is permitted.
4. Round amounts off the nearest whole dollar, the total shall equal the Contract Sum.
5. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
6. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete including its total cost and proportionate share of general overhead and profit margin.
 - a. At the Contractors' option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the Schedule of Values or distributed as general overhead expense.
7. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives result in a change in the contract sum.

1.04 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as reviewed by the Owner representative and paid for by the Owner.
 - 1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the Final Application for Payment involve additional requirements.
- B. Payment Application Times: The period of construction work covered by each Application of Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use the County's most updated form as the form for Application for Payment. Form given at the Preconstruction Conference.
- D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
 - 1. Entries shall match data on the Schedule of Values and Contractors' Construction Schedule. Use updated schedules if revisions have been made.
 - 2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.
- E. Transmittal: Submit five (5) original executed copies of each Application for Payment to the Project Manager by means ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.
 - 1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Project Manager.
- F. Payment will be processed once a month. Payment for item will be based on percentage completed as determined and approved by the County Project Manager or invoice for stored materials. Retainage (10%) will be held for all applications.
- G. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work. Application shall also include all items listed in Part H. above.
- H. Final Payment Application: Administrative actions and submittals, which must precede or coincide with submittal of the final payment. Application for Payment includes the following:
 - 1. Completion of Project Close-Out requirements
 - 2. Completion of items specified for completion after Substantial Completion (Punch List)
 - 3. Contractor's release of lien (on Owner's form)
 - 4. Subcontractor and material supplier release of lien (If applicable)
 - 5. Consent of Surety

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6. Power of attorney
7. Asbestos-free letter, notarized

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 010270

SECTION 010350 - MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This section specifies administrative and procedural requirements for handling and processing Contract modifications.

1.03 MINOR CHANGES IN THE WORK

- A. Supplemental instructions authorizing minor changes in the work, not involving an adjustment to the Contract Sum or Contract Time, will be issued by the Project Manager.

1.04 CHANGE ORDER PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Proposed changes in the work that will require adjustment to the Contract Sum or Contract Time will be issued by the Project Manager, with a detailed description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.
 - 1. Proposal requests issued by the Project Manager are for information only. Do not consider them instruction either to stop work in progress, or to execute the proposed change.
 - 2. Unless otherwise indicated in the proposal request, within 7 days of receipt of the proposal request, submit to the Project Manager from the Owner's review, an estimate of cost necessary to execute the proposed change.
 - a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include a statement indicating the effect the proposed change in the work will have on the Contract Time.
 - d. Contractor and subcontractors will provide a complete detailed labor and material breakdown to justify change order request amount.

- B. Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions in mutual accord with the Owner Representative's findings require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.
1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
 2. Include a list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Comply with requirements in Section 016310 Product Substitutions- if the proposed change in the work requires that substitution of one product or system for a product or system not specified.
 5. Contractor and subcontractors will provide a complete detailed labor and material breakdown to justify change order request amounts.

1.05 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Project Manager may issue a Construction Change Directive instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. The Construction Change Directive will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.07 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Change Order Proposal Request, the Project Manager will issue a Change Order for signatures of the Owner and Contractor on County's Change Order form, as provided in the Conditions of the Contract.

PART 2 PRODUCTS (Not Applicable)

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PART 3 EXECUTION (Not Applicable)

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END OF SECTION 010350

SECTION 010400 - PROJECT COORDINATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies administrative and supervisory requirements necessary for project coordination including, but not necessarily limited to:
 - 1. Coordination
 - 2. Administrative and supervisory personnel
 - 3. General installation provisions
 - 4. Cleaning and protection
- B. Progress meetings, coordination meetings and Pre-installation conferences are included in Section 012000 'Project Meetings'.
- C. Requirements for the Contractor's Construction Schedule are included in Section 013000 'Submittals'.

1.03 COORDINATION

- A. Coordination: Coordinate construction activities included under various Sections of these Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specification that are dependent upon each other for proper installation, connection, and operation.
 - 1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
 - 2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required: notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Schedules
 2. Installation and removal of temporary facilities
 3. Delivery and processing of submittals
 4. Progress meetings
 5. Project close-out activities
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment (if any) involved in performance of, but not actually incorporated in, the Work.
- E. Lack of coordination as specified in this and other sections of the contract documents are in grounds for assessment of back charges and/or termination in order to remediate the situation.

1.04 SUBMITTALS

- A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.
1. Show the interrelationship of components shown on separate Shop Drawings.
 2. Indicate required installation sequences.
 3. Comply with requirements contained in Section Submittals.
 4. Refer to Facility Services documents for specific coordination Drawing requirements for mechanical and electrical installations.
- B. Staff Names: At the Preconstruction Conference submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.
1. Post copies of the list in the project meeting room, the temporary field office, and each temporary telephone.

PART 2 PRODUCTS (Not Applicable)

3.01 GENERAL INSTALLATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
- D. Provide attachment and connection devices and methods necessary for securing work. Secure work true to line and level. Allow for expansion and building movement.
- E. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to Project Manager for final decision.
- F. Recheck measurements and dimensions, before starting each installation.
- G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
- H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Engineer/Project Manager for final decision.

3.02 CLEANING AND PROTECTION

- A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- B. Clean and maintain completed construction as directed by the Project Manager and as frequently as necessary to ensure its integrity and safety through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

- C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where the applicable, such exposures include, but are not limited to, the following:
1. Excessive static or dynamic loading
 2. Excessively high or low temperatures
 3. Excessively high or low humidity
 4. Air contamination or pollution
 5. Water
 6. Solvents
 7. Chemicals
 8. Soiling, staining and corrosion
 9. Rodent and insect infestation
 10. Combustion
 11. Destructive testing
 12. Misalignment
 13. Excessive weathering
 14. Unprotected storage
 15. Improper shipping or handling
 16. Theft
 17. Vandalism

END OF SECTION 010400

SECTION 010450 - CUTTING AND PATCHING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for cutting and patching.
- B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - 1. Requirements of this Section apply to mechanical and electrical installations. Refer to Facility Services Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.03 SUBMITTALS

- A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:
 - 1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
 - 2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
 - 3. List products to be used and firms or entities that will perform Work.
 - 4. Indicate dates when cutting and patching is to be performed.
 - 5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
 - 6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

7. Approval by the Engineer to proceed with cutting and patching does not waive the Engineer's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.04 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load carrying capacity or load-deflection ratio.
 1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements.
 - a. Structural steel
 - b. Lintels
 - c. Structural decking
 - d. Miscellaneous structural metals
 - e. Exterior curtain wall construction
 - e. Structural systems of special construction.
- B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.
 1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems.
 - a. Shoring, bracing and sheeting
 - b. Primary operational systems and equipment
 - c. Air or smoke barriers
 - d. Water, moisture, or vapor barriers
 - e. Membranes and flashings
 - f. Fire protection systems
 - g. Noise and vibration control elements and systems
 - h. Control systems
 - I. Communication systems
 - j. Conveying systems
 - k. Electrical wiring systems
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Engineer's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace work cut and patched in a visually unsatisfactory manner.
 1. If possible retain the original installer or fabricator to cut and patch the following categories of exposed work, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm:
 - a. Preformed metal panels
 - b. Window wall system
 - c. Roofing systems

2.01 MATERIALS

- A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect unless otherwise indicated by Engineer/Owner. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 EXECUTION

3.01 INSPECTION

- A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.
 - 1. Before proceeding, meet at the site with all parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.02 PREPARATION

- A. Temporary Support: Provide temporary support of work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas and interruption of free passage to adjoining areas.
- D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

- B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.
1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 3. Cut through concrete and masonry using a cutting machine such as a Carborundum saw or diamond core drill.
 4. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
 2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials if necessary to achieve uniform color and appearance.
 - a. Where patching occurs in smooth painted surfaces, extend final coat over entire unbroken surfaces containing the patch, after the patched area has received primer and second coat.

3.04 CLEANING

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged materials to their original condition.

END OF SECTION 010450

SECTION 010950 - REFERENCE STANDARDS AND DEFINITIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. Indicated: The term *indicated* refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as shown, noted, scheduled and specified are used, it is to help the reader locate the reference; no limitation on location is intended.
- C. Directed: Terms such as directed, requested, authorized, selected, accepted, required, and permitted mean directed by the Project Manager, requested by the Engineer/Project Manager and similar phrases.
- D. Approved: This term approved means accepted, where used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in the Conditions of the Contract.
- E. Regulations: The term Regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. Furnish: The term furnish is used to mean supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. Install: The term install is used to describe operations at project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. Provide: The term provide means to furnish and install, complete and ready for the intended use.
- I. Installer: An Installer is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 - 1. The term experienced, when used with the term Installer, means having a minimum of five previous projects similar in size and scope to this Project, being familiar

with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.

2. Trades: Use of titles such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.
- J. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.
- K. Testing Laboratories: A testing laboratory is an independent entity engaged to perform specific inspections or tests, either at the Project sites or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
- L. Florida Building Code (FBC): Where the term or acronym is used it will mean the current edition of the Florida Building Code with all applicable revisions adopted by the authorities having jurisdictions at the location of the Project.

1.03 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's MASTER FORMAT numbering system.
 1. Division 00 and Divisions 02 through 49 are based on Master Format 2014
- B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
 1. Abbreviated Language: Language used in Specifications and other Contract Documents is the abbreviated type. Words and meaning shall be interpreted as appropriate. Words that are implied, but not stated shall be interpolated as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.
 2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.
 - a. The words, shall be shall be included by inference wherever a colon (:) is used within a sentence or phrase.

1.04 INDUSTRY STANDARDS

- A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copies directly into the Contract Documents to the extend reference. Such standards are made part of the Contract Documents by reference.
- B. Publication Dates: Comply with the standard in effect as of the date of the Contract Documents.
- C. Conflicting Requirements: Where compliances with two or more standards are specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels. Refer requirements that are different, but apparently equal, and uncertainties to the Engineer for a decision before proceeding.
 - 1. Minimum Quantity or Quality Levels: The quantity of quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Engineer/Owner for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed for performance of a required construction activity. The Contractor shall obtain copies directly from the publication source or any other authorized source.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. See Trade Reference List at the end of this Section refer to the Encyclopedia of Associations, published by Gale Research Co., available in most libraries.

1.05 SUBMITTALS

- A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulation bearing upon performance of the Work.

PART 2 PRODUCTS

ORANGE COUNTY CONVENTION CENTER
WEST BUILDING, HALL "A" NATURAL GAS RETROFIT
17G0189

100% CDS

(Not Applicable)

PART 3 EXECUTION

(Not Applicable)

END OF SECTION 010950

SECTION 012000 - PROJECT MEETINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
 - 1. Pre-Construction Conference
 - 3. Coordination Meetings
 - 4. Progress Meetings
- B. Construction schedules are specified in Section 013000 Submittals.

1.03 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a pre-construction conference and organizational meeting at the project site or other convenient location no later than 20 days after execution of the agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: The OWNER'S Representative, Engineer, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.
- C. Agenda: Discuss items of significance that could affect progress including such topics as:
 - 1. Tentative construction schedule
 - 2. Critical Work sequencing and/coordinating
 - 3. Designation of responsible personnel
 - 4. Procedures for processing field decisions and Change Orders
 - 5. Procedures for processing Applications for Payment
 - 6. Distribution of Contract Documents
 - 7. Submittal of Shop Drawings, Product Data and Samples
 - 8. Preparation of record documents
 - 9. Use of the Premises
 - 10. Office, Work and storage areas
 - 11. Equipment deliveries and priorities
 - 12. Safety procedures

13. First aid
14. Security
15. Housekeeping
16. Working hours

D. Contractor must submit at the time of the meeting at least the following items:

1. Schedule of Values
2. Listing of key personnel including project superintendent and subcontractors with their addresses, telephone numbers, and emergency telephone numbers.
3. Preliminary Construction Schedule
4. Submittal Schedule

1.05 COORDINATION MEETINGS

- A. Conduct project coordination meeting at weekly intervals on day and time as established by the Project Manager or more frequently, if necessary convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.
- B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved, to include subcontractors and representatives.
- C. Contractor shall record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.06 PROGRESS MEETINGS

- A. Conduct progress meetings at the Project site at bimonthly intervals or more frequently if necessary as directed by the Project Manager. Notify the Owner at least 48 hours in advance of scheduled meeting time and dates. Coordinate dates of meetings with preparation of the payment request.
- B. Attendees: In addition to representatives of the Owner and Engineer, each subcontractor, supplier or other entity concerned with current progress of involved in planning, coordination or performance of future activities with the project and authorized to conclude matters relating to progress.
- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.
 1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time, ahead, or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

2. Review the present and future needs of each entity present, including such items as:
 - a. Interface requirements
 - b. Time
 - c. Sequences
 - d. Deliveries
 - e. Off-site fabrication problems
 - f. Access
 - g. Site utilization
 - h. Temporary facilities and services
 - I. Hours of work
 - j. Hazards and risks
 - k. Housekeeping
 - l. Quality and work standards
 - m. Change Orders
 - n. Documentation of information for payment requests.

- D. Reporting: No later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, or progress since the previous meeting and report.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

(Not Applicable)

END OF SECTION 012000

SECTION 013000 - SUBMITTALS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:
 - 1. Contractor's Construction Schedule
 - 2. Submittal Schedule
 - 3. Daily Construction Reports
 - 4. Shop Drawings
 - 5. Product Data
 - 6. Samples
- B. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
 - 1. Permits
 - 2. Applications for Payment
 - 3. Performance and Payment Bonds
 - 4. Insurance Certificates
 - 5. List of Subcontractors with start and finish dates (update as necessary)
 - 6. Schedule of Values
 - 7. Construction Schedule
- C. The Schedule of Values submittal is included in Section 010270 Applications for Payment.

1.03 SUBMITTAL PROCEDURES

- A. Review, stamp and approve each submittal prior to transmitting to Engineer. Without such stamp and signature, submittal will be returned NOT REVIEWED.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Project Manager reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 3. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
 - a. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Project Manager will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. Allow two weeks for reprocessing each submittal.
 - d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.
- A. Electronic Submittal Administrative Requirements
1. Identify and incorporate information in each electronic submittal file as follows:
 - a. Assemble complete submittal package into a single indexed and bookmarked file with links enabling navigation to each item.
 - b. Scanned using 300 dpi resolution
 - c. Name file with submittal number identifier described in Part 1 Article – Submittal Procedures
 - d. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by all reviewers.
 - e. Samples will require a physical delivery with transmittal. Sample approval may be electronic, depending on submittal requirements of that section.
 2. Post electronic submittals as PDF electronic files directly to designated FTP site specifically established for Project. Notify Engineer via email when shop drawing files have been posted.
 - a. Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - b. Provide electronic submittals for:
 - 1) Product Data
 - 2) Shop Drawings
 - 3) Project Schedule
 - 4) Sustainable Construction Program Submittals

- 5) Delegated Design Services
- c. Required Number of Submittals:
 - 1) Submit one CD with Shop Drawings
 - 2) Scan all pages of submittal to .pdf format and submit on a CD
 - 3) Distribution: 1 CD will returned for printing and distribution
3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically-submitted certificates
- D. Contractor shall be responsible for cost of re-review of rejected submittals. Costs for re-review shall be reimbursed to the County by deducting the cost from the Contractors monthly progress payments. Costs to be determined by applying the consultant's standard billing rates, plus 10% handling by the County.
- E. Substitution request to specified products will be made within 30 days of Notice to Proceed. After the 30 day period, no requests for substitutions from the Contractor will be considered.
 1. Substitution submitted within the first 30 days will have product data from specified and requested substitute submitted together and demonstrate better quality, cost savings if of equal quality, or show benefit to the County for accepting the substitute.
- F. Once submittals are approved or approved as noted, they will be transmitted to the Owner.

1.04 CONTRACTOR'S CONSTRUCTION SCHEDULE (LINEAR BAR CHART SCHEDULE)

- A. Linear bar chart time control schedule
 1. Work overtime, nights, and weekends, as necessary to maintain schedule.
 2. Overtime, night, and weekend work will be at no additional cost to the Owner.
 3. Expedite approvals and deliveries of material so as not to delay job progress.
- B. Contract Modifications: For each proposed contract modification and concurrent with its submission, demonstrate the effect of the proposed change on the project schedule.
- C. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 1. Identification of activities that have changed.
 2. Changes in start dates.
 3. Changes in finish dates.
 4. Changes in the Contract Time.

1.05 SUBMITTAL LOG

- A. After development and acceptance of the Contractor's construction schedule, prepare a complete log of submittals.
1. Coordinate submittals log with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.
 2. Prepare the log in chronological order; include all submittals required. Provide the following information:
 - a. Scheduled date for the first submittal
 - b. Related Section number
 - c. Submittal category
 - d. Name of subcontractor
 - e. Description of the part of the work covered
 - f. Scheduled date for resubmittal
 - g. Scheduled date the Engineer's final release or approval.
 3. All submittals must be received within the first 25% of contract time.
- B. Distribution: Following response to initial submittal, print and distribute copies to the Project Manager, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the project meeting room and field office.
1. When revision are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. Log Updating: Revise the log after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.06 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Project Manager at weekly intervals:
1. List of subcontractors at the site
 2. Approximate count of personnel at the site
 3. High and low temperatures, general weather conditions
 4. Accidents and unusual events
 5. Meetings and significant decisions
 6. Stoppages, delays, shortages, losses
 7. Meter readings and similar recordings
 8. Emergency procedures
 9. Orders and requests of governing authorities
 10. Change Orders received, implemented
 11. Services connected, disconnected

12. Equipment or system tests and start-ups
13. Partial completions, occupancies
14. Substantial Completions authorized

1.07 SHOP DRAWINGS

- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered a Shop Drawings and will be rejected.
- B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
 1. All required dimensions
 2. Identification of products and materials included
 3. Compliance with specified standards
 4. Notation of coordination requirements
 5. Notation of dimensions established by field measurement
 6. Sheet Size: Except for templates, patterns and similar full-size Drawings on sheets at least 8 1/2" x 11" but no larger than 24" x 36".
 7. Number of Copies: Submit one (1) electronic copy of each submittal to the County's Representative, unless copies are required for operation and maintenance manuals. Submit one (1) electronic copy where copies are required for operation and maintenance manuals. Engineer will retain 1 electronic copy. Mark up and retain one returned electronic copy as a Project Record Drawing.
 8. Submit one (1) hard copy once approved for legal seal stamping if needed at jobsite. Coordinate with Engineer and County's Representative.
 9. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connections with construction.
- C. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.
 1. Preparation of coordination Drawings is specified in section Project Coordination and may include components previously shown in detail on Shop Drawings or Product Data.
 2. Contractor is not entitled to additional payments due to lack of compliance with this Section.

1.08 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as a Shop Drawing.
1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations
 - b. Compliance with recognized trade association standards
 - c. Compliance with recognized testing agency standards
 - d. Application of testing agency labels and seals
 - e. Notation of dimensions verified by field measurement
 - f. Notation of coordination requirements
 - g. Manufacturers local representative and phone number.
 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
 3. Preliminary Submittal: Submit a preliminary single-copy of Product Data where selection of options is required.
 4. Submittals: Submit six (6) copies of each required submittal. The Project Manager will return two (2) sets to the Contractor marked with action taken and corrections or modifications required.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 5. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
 - a. Do not proceed with installation until an applicable copy of Product Data applicable is in the Installer's possession.
 - b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.09 SAMPLES

- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of materials, color range sets, and swatches showing color, texture and pattern.
1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Engineer's/Owner's Sample. Include the following:

- a. Generic description of the Sample
 - b. Sample source
 - c. Product name or name of manufacturer
 - d. Compliance with recognized standards
 - e. Availability and delivery time
2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.
 - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
 3. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
 - a. Preliminary submittals will be reviewed and returned with the Engineer's/Owner's mark indicating selection and other action.
 4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.
 5. Maintain sets of Samples, as returned, at the project site, for quality comparisons throughout the course of construction.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 - b. Sample sets may be used to obtain final acceptance of the construction associated with each set.
- B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.
1. Field Samples specified in individual sections are special types of Samples. Field Samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the work will be judged.
 - a. Comply with submittal requirements. Process transmittal forms to provide a record of activity.

1.10 ENGINEER'S ACTION

- A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Engineer/Project Manager will review each submittal, mark to indicate action taken, and return promptly.
 - 1. Compliance with specified characteristics is the Contractor's responsibility.
- B. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, similarly as follows, to indicate the action taken:
 - 1. Final Unrestricted Release: Work may proceed, provided it complies with contract documents, when submittal is returned with the following: "No Exceptions Taken"
 - 2. Final-But Restricted Release: Work may proceed, provided it complies with notations and corrections on submittal and with contract documents, when submittal is returned with the following: "Note Comments"
 - 3. Returned for Resubmittal: Do not proceed with work. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain a different action marking. Do not allow submittals with the following marking (or unmarked submittals where a marking is required) to be used in connection with performance of the work: "Resubmit"
 - a. Do not permit submittals marked 'Revise and Resubmit' to be used at the Project site, or elsewhere where work is in progress.
 - 4. Rejected: Submittal does not comply with requirements of the Contract Documents. Submittal must be discarded and entirely new submittal shall be forward to the Project Manager without delay: "Rejected"

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

(Not Applicable)

END OF SECTION 013000

SECTION 016000 - MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
- B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section 013000 -Submittals.
- C. Administrative procedures for handling requests for substitutions made after award of the Contract are included under Section 016310 'Product Substitution'.

1.03 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents such as 'specialties', 'systems', 'structure', 'finishes', 'accessories', and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.
 - 1. 'Products' are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term 'product' includes the term 'material', 'equipment', 'system' and terms of similar intent.
 - a. 'Named Products' are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
 - b. 'Foreign Products', as distinguished from 'domestic products', are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions; or produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens nor living within the United States and its possessions.
 - 2. 'Materials' are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the work.
 - 3. 'Equipment' is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.04 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.
- B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
- C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on accessible surface that is not conspicuous.
 - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data.
 - a. Name of product and manufacturer
 - b. Model and serial number
 - c. Capacity
 - d. Speed
 - e. Ratings
 - f. Additional pertinent information

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deteriorating and loss, including theft.
 - 1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
 - 3. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
 - 4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weather tight enclosure, with ventilation adequate in prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 PRODUCTS

2.01 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.
 1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situation on other projects.
- B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous project experience. Procedures governing product selection include the following:
 1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
 - a. Where products or manufacturers are specified by name, accompanied by the term 'or equal' or 'or approved equal' comply with the Contractor Document provisions concerning 'substitutions' to obtain approval for use of an unnamed product.
 2. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of those products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning 'substitutions' to obtain approval for use of an unnamed product.
 3. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand

or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated.
 - a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
5. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.
6. Visual Matching: Where Specifications require matching an established Sample, the Engineer's decision will be final on whether a proposed product matches satisfactorily.
 - a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning 'substitutions' for selection of a matching product in another product category, or for noncompliance with specified requirements.
7. Visual Selection: Where specified product requirements include the phrase "as selected from manufacturer's standard colors, pattern, textures" or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Engineer will select the color, pattern and texture from the product line selected.
8. Asbestos free materials: No products containing asbestos shall be used for any part of the work for this product. Provide verification.

PART 3 EXECUTION

3.01 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each project securely in place, accurately located and aligned with other work.
 1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 016000

SECTION 016310 - PRODUCT SUBSTITUTIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling request for substitutions.
- B. The Contractor's Installation Schedule and the Schedule of Submittals are included under Section Submittals.
- C. Standards: Refer to Section 010950 Reference Standards and Definitions for applicability of industry standards to products specified.
- D. Procedural requirements governing the Contractor's selection of products and product options are included under Section Materials and Equipment.

1.03 DEFINITIONS

- A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Requests for changes in products, materials, equipment, and methods of installation required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for substitutions. The following are not considered substitutions:
 - 1. Only substitutions requested by Contractor are considered as included in the Contract Documents and are not subject to requirements specified in Section for substitutions.
 - 2. Revisions to Contract Documents requested by the Owner or Engineer.
 - 3. Specified options of products and installation methods included in Contract Documents.
 - 4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.04 SUBMITTALS

- A. Substitution Request Submittal: Request for substitution will be considered if received within thirty (30) days after commencement of the Work, as long as this time allowance will not impact the construction schedule,
1. Submit three (3) copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.
 2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitution, and the following information, as appropriate:
 - a. Product Data, including Drawings, and descriptions of products, fabrication and installation procedures.
 - b. Samples, where applicable or requested.
 - c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
 - d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractor's that will become necessary to accommodate the proposed substitution.
 - e. A statement indicating the substitution's effect on the Contractor's construction schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
 - f. Cost information, including a proposal of the net change, if any in the Contract Sum.
 - g. Certification by the Contractor that the Substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the contractor's waiver of rights to additional payment or time, that may subsequently become necessary because of the failure of the substitution to perform adequately.
 3. Engineers Action: Within two weeks of receipt of the request for substitution, the Engineer will request additional information or documentation necessary for evaluation of the request if needed. Within two (2) weeks of receipt of the request, or one week of receipt of the additional information or documentation, whichever is later, the Engineer will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the project specified by name. Decision on the use of a product substitution or its rejection by the Engineer is considered final. Acceptance will be in the form of a Change Order.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

- A. Conditions: The Contractor's substitution request will be received and considered by the Engineer when one or more of the following conditions are satisfied, as determined by the Engineer; otherwise request will be returned without action except to record noncompliance with these requirements.
1. Extensive revisions to Contract Documents are not required.
 2. Proposed changes are in keeping with the general intent of Contract Documents.
 3. The request is timely, fully documented and properly submitted.
 4. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the work promptly or coordinate activities properly.
 5. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
 6. A substantial advantage is offered to the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Engineer for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar consideration.
 7. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
 8. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
 9. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.
- B. The Contractor's submittal and Project Manager's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.
- C. Substitution request constitutes a representation that the Contractor:
1. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.
 2. Will provide the same warranty for substitution as for specified product.

3. Will coordinate installation and make other changes which may be required for work to be complete in all respects.
4. Waives claims for additional costs which may subsequently become apparent. All costs associated with the substitution will be paid by the Contractor regardless of approvals given, and regardless of subsequent difficulties experienced as a result of substitutions.

PART 3 EXECUTION

NOT USED

END OF SECTION 016310

SECTION 017000 - PROJECT CLOSE-OUT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for project close-out, including but not limited to:
 - 1. Inspection procedures
 - 2. Project record document submittal. (Substantial Completion requirements)
 - 3. Operating and Maintenance Manual Submittal (Substantial Completion requirements).
 - 4. Submittal of warranties (Substantial Completion requirement).
 - 5. Final cleaning
- B. Close-out requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 49.
- C. Final Payment to be made when the County has received all required close-out documents.

1.03 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for Certification of Substantial Completion, complete the following: List exceptions in the request.
 - 1. In the Application for Payment that coincided with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
 - a. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the work is not complete.
 - 2. Advise Owner of pending insurance change-over requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.

4. Obtain and submit releases enabling the Owner unrestricted use of the work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
 5. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.
- B. Inspection Procedures: On receipt of a request for inspection, the Project Manager will either proceed with inspection or advise the Contractor of unfilled requirements. The Project Manager will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
1. Results of the completed inspection will form the basis of requirements for final acceptance.
 2. Should the project fail to meet the standards required for Substantial Completion as defined in the documents, the Contractor will pay the expense of a second inspection by the Engineer/Consultants and the Owner. Cost will be deducted from the Contractor's retainage.

1.04 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following list exceptions in the request:
1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and complete operations where required.
 2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
 3. Submit a certified copy of the Engineer or Owner's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Project Manager.
 4. Submit final meter readings for utilities, a measured record of stored fuel and similar data as of the date of Substantial Completion, or when the Owner took possession of the responsibility for corresponding elements of the Work.
 5. Submit consent of surety to final payment.
 6. Submit a final liquidated damages settlement statement
 7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

- B. Reinspection Procedure: The Engineer will reinspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Engineer.
 - 1. Upon completion of reinspection, the Engineer will prepare a certification of final acceptance, or advise the contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

1.05 RECORD DOCUMENT SUBMITTALS

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation; where the installation varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Provide for project photographs if deemed necessary by Owner's representative.
 - 1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
 - 2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
 - 3. Note related Change Order numbers where applicable.
 - 4. Submit one (1) hardcopy of the most current record set of drawings when the project is considered 50% substantially complete for review and comment by Owner.
 - 5. Organize record drawing sheets, and print suitable titles, dates and other identification on the cover of each set.
 - 6. Provide three (3) additional sets of black line drawing sets of As-Builts Drawings.
 - 7. Provide one (1) CD-ROM with all As-Built Drawings in AutoCAD and PDF format.
- C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual work performed in comparison with the text of the specifications and modifications. Give particular attention to substitutions, selection of options

and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Project Data.

1. Upon completion of the Work, submit record Specifications to the Engineer for the Owner's records.
- D. Record Project Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variation in actual work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications.
1. Upon completion of mark-up, submit complete set of record Product Data in the three ring binder (indexed) to the Engineer for the Owners records.
- E. Record Sample Submitted: Immediately prior to the date or dates of substantial completion, the Contractor will meet at the site with the Engineer and the Owners personnel to determine which of the submitted Samples that have been maintained during progress of the work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owners Sample storage area.
- F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to the date or dates of substantial completion, complete miscellaneous record and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Project Manager for the Owner's records.
- G. Maintenance Manuals: Organize operating and maintenance data into five (5) suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:
1. Emergency instructions
 2. Spare parts list
 3. Copies of warranties
 4. Wiring diagrams
 5. Recommended turn-around cycles
 6. Inspection procedures
 7. Shop Drawings and Product Data
 8. Fixture lamping schedule

PART 2 PRODUCTS

NOT APPLICABLE

3.01 CLOSE-OUT PROCEDURES

- A. Operating and Maintenance Instructions: Arrange for each installer of equipment that required regular maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. All items to be provided or completed prior to Certificate of Substantial Completion being issued by the Owner. Include a detailed review of the following items:
1. Maintenance manuals
 2. Record documents
 3. Spare parts and materials
 4. Tools
 5. Lubricants
 6. Fuels
 7. Identification systems
 8. Control sequences
 9. Hazards
 10. Cleaning
 11. Warranties and bonds
 12. Maintenance agreements and similar continuing commitments
 13. On site instructions to County maintenance personnel on major systems operations such as HVAC as per technical specifications.
- B. As part of instruction for operating equipment, demonstrate the following procedures, prior to the Owner issuing Certificate of Substantial Completion:
1. Start-up
 2. Shutdown
 3. Emergency operations
 4. Noise and vibration adjustments
 5. Safety procedures
 6. Economy and efficiency adjustments

3.02 PROJECT CLOSE-OUT MANUALS AT SUBSTANTIAL COMPLETION

- A. Submit Project Close-out Manuals prior to issuance of final application for payment. Provide three (3) copies.
- B. Bind in commercial quality 8.5 x 11" three ring binder, indexed with hardback, cleanable, plastic covers.
- C. Label cover of each binder with typed title PROJECT CLOSE-OUT MANUAL, with title of project; name, address, and telephone number of Contractor and name of responsible Principal.
- D. Provide table of contents: Neatly typed, in the following sequence:

1. Final Certificate of Occupancy
 2. Warranty Service Subcontractors Identification List
 3. Final Lien Waivers and Releases
 4. Warranties and Guarantees
 5. Systems Operations and Maintenance Instruction
 6. Manufacturer's Certificates and Certifications
 7. Maintenance Service Contracts
 8. Spare Parts Inventory List
 9. Special Systems Operating Permits or Approvals
 10. Asbestos free materials notarized statement
- E. Provide all documents for each section listed. List individual documents in each section in the Table of Contents, in the sequence of the Table of Contents of the Project Manual.
- F. Identify each document listed in the Table of Contents with the number and title of the specification section in which specified, and the name of the product or work item.
- G. Separate each section with index to sheets that are keyed to the Table of Contents listing.
- H. Warranty Service Subcontractors List shall identify subcontractor supplier, and manufacturer for each warranty with name, address and emergency telephone number.
- I. Electronic Close-out DVD: At the completion of the project, submit one copy of a DVD with entire project close out information below in PDF format. All letter, legal and brochure size sheets shall be portrait and the As-built drawings will be landscape. All fonts will be Arial. All items will be in PDF with OCR (Optical Character Recognition). This will enable a search engine to identify words on the scanned documents.
1. Contacts: Set up a separate PDF for the contacts. No bookmarks are needed for this section.
 2. As-Built: All as-built drawings will be landscape.
 3. Submittals: All technical submittal items (approved and approved as noted) will be provided and sorted by Division. Bookmarks will be needed for the appropriate divisions.
 4. Operations and Maintenance Manual: Specify the Division name only in the book-marks. Please note that all items will be in PDF with OCR (Optical Character Recognition). This will enable a search engine to identify works on the scanned documents.
 5. Permitting: This should include the Certificate of Occupancy and any other document that the Project Manager may include pertaining to the permitting for the project.

3.03 FINAL CLEANING

- A. General: General cleaning during construction is required by the General Conditions and included in Section - Temporary Facilities.

- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
 - 1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
 - a. Remove labels that are not permanent labels.
 - b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 - c. Clean exposed exterior and interior hard-surfaced finished to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 - d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
 - e. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface. Remove waste and surplus materials from the site in an appropriate manner.
- C. Pest Control: Engage an experienced exterminator to make a final inspection, and rid the Project of rodents, insects and other pests.
- D. Removal of Protection: Remove temporary protection and facilities installed for protection of the work during construction.
- E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.
 - 1. Where extra materials of value remaining after completion of associated work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION 017000

SECTION 017400 - WARRANTIES AND BONDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contractor Documents, including manufacturer's standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.
 - 2. General close-out requirements are included in Section 017000 Project Close-Out.
 - 3. Specific requirements for warranties for the work and products and installations that are specified to be warranted, are included in the individual Sections.
 - 4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- B. Disclaimers and Limitations: Manufacturers' disclaimers and limitations on product warranties to not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.03 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.
- B. Reinstatement of Warranty. When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents.

- D. Owners Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligation, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligation, rights, or remedies.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- E. The Owner reserves the right to refuse to accept work for the Project where a special warranty, certification, or similar commitment is required on such work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.04 WARRANTY PERIOD

- A. The Contractor shall participate with the County and the Engineers' representative, at the beginning of the tenth month of the warranty period, in conducting an on site review and evaluation of all items of equipment, materials and workmanship covered by the warranties and guarantees. Contractor shall act promptly and without cost to the County to correct all defects, problems, or deficiencies determined as such by the Engineer/Owner during on the site review.
- B. All warranties and guarantees shall commence on the date of Final Completion except for items which are determined by the County to be incomplete or a non-comply status at the time of Final Completion. The coverage commencement date for warranties and guarantees of such work shall be the date of the County's acceptance of that work.
- C. Warranty period shall be manufacturers standard for product specified except where specific warranty periods are specified in individual sections. But in no case less than one year.

1.05 SUBMITTALS

- A. Submit written warranties to the Owner prior to the date certified for Substantial Completion. If the Engineer's Certificate of substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the work, submit written warranties upon request of the Project Manager.
 - 1. When a designated portion of the work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Project Manager within fifteen days of completion of that designated portion of the work.
- B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepared a written document that contains appropriate terms and identification, ready for executing by the required parties. Submit a draft to the Engineer for approval prior to final execution.

1. Refer to individual Sections for specific content requirements, and particular requirements for submittal of special warranties.
- C. Form of Submittal: At Final Completion compile two (2) copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- D. Bind (3) three sets of warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8 ½ by 11" paper.
1. Provide heavy paper dividers with Celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
 2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the Project title or name, and the name of the Contractor.
 3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 PRODUCTS

NOT APPLICABLE

PART 3 EXECUTION

NOT APPLICABLE

END OF SECTION 017400

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in smoke barriers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. Approved Substitution.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
- E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
 1. Permanent forming/damming/backing materials.
 2. Substrate primers.
 3. Collars.
 4. Steel sleeves.

2.3 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

3.4 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- C. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- D. Install lateral bracing with pipe hangers and supports to prevent swaying.
- E. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- F. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

3.2 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inch.

3.3 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and attachments for general service applications.
- F. Use padded hangers for piping that is subject to scratching.
- G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 - 3. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 4. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
 - 5. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 6. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 7. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 - 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- J. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 220529

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Pipe labels.
- 2. Valve tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Valve numbering scheme.
- D. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

2.2 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 - 1. Tag Material: Brass, 0.032-inch, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass wire-link or beaded chain.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or accessible maintenance spaces such as catwalks and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above, removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Low-Pressure, Natural Gas Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.

3.3 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 1. Valve-Tag Size and Shape:
 - a. Natural Gas: 1-1/2 inches, round.
 2. Valve-Tag Color:
 - a. Low-Pressure Natural Gas: Brass.
 3. Letter Color:
 - a. Low-Pressure Natural Gas: Black.

END OF SECTION 220553

SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipes, tubes, and fittings.
 - 2. Piping specialties.
 - 3. Piping and tubing joining materials.
 - 4. Valves.
 - 5. Pressure regulators.
 - 6. Mechanical sleeve seals.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
 - 1. Piping and Valves: 100 psig minimum unless otherwise indicated.
 - 2. Service Regulators: 100 psig minimum unless otherwise indicated.
- B. Natural-Gas System Pressure down stream of service meter: Refer to drawings.

1.5 SUBMITTALS

- A. Product Data: For each type of the following:

1. Piping and specialties.
2. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
3. Pressure regulators. Indicate pressure ratings and capacities.
4. Dielectric fittings.
5. Mechanical sleeve seals.
6. Escutcheons.

B. Operation and Maintenance Data: For piping specialties.

1.6 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.
- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.8 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:
 1. Notify Architect and Owner in advance of proposed interruption of natural-gas service.
 2. Do not proceed with interruption of natural-gas service without Architect's and Owner's written permission.

1.9 COORDINATION

- A. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 - 2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 - 3. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - a. Material Group: 1.1.
 - b. End Connections: Threaded.
 - c. Lapped Face: Not permitted underground.
 - d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
 - e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground.

2.2 PIPING SPECIALTIES

- A. Appliance Flexible Connectors:
 - 1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
 - 2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
 - 3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
 - 4. Corrugated stainless-steel tubing with polymer coating.
 - 5. Operating-Pressure Rating: Refer to Appliance manufacturer.
 - 6. End Fittings: Zinc-coated steel.
 - 7. Threaded Ends: Comply with ASME B1.20.1.
 - 8. Maximum Length: 72 inches
- B. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.

2.4 MANUAL GAS SHUTOFF VALVES

- A. See "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.
- B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.
 - 1. CWP Rating: 125 psig.
 - 2. Threaded Ends: Comply with ASME B1.20.1.
 - 3. Tamperproof Feature: Locking feature for valves indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 4. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 - 5. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.
- C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.
 - 1. CWP Rating: 125 psig.
 - 2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
 - 3. Tamperproof Feature: Locking feature for valves indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 4. Service Mark: Initials "WOG" shall be permanently marked on valve body.
- D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BrassCraft Manufacturing Company; a Masco company.
 - b. Conbraco Industries, Inc.; Apollo Div.
 - c. Lyall, R. W. & Company, Inc.
 - d. McDonald, A. Y. Mfg. Co.
 - e. Perfection Corporation; a subsidiary of American Meter Company.
 - f. NIBCO Inc.
 - 2. Body: Bronze, complying with ASTM B 584.
 - 3. Ball: Chrome-plated bronze.
 - 4. Stem: Bronze; blowout proof.
 - 5. Seats: Reinforced TFE; blowout proof.
 - 6. Packing: Threaded-body packnut design with adjustable-stem packing.
 - 7. Ends: Threaded, "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 8. CWP Rating: 600 psig.
 - 9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 - 10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- E. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lee Brass Company.
 - b. McDonald, A. Y. Mfg. Co.
2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 MOTORIZED GAS VALVES

A. Automatic Gas Valves: Comply with ANSI Z21.21.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ASCO Power Technologies, LP; Division of Emerson.
 - b. Honeywell International Inc.
 - c. Johnson Controls.
2. Body: Brass or aluminum.
3. Seats and Disc: Nitrile rubber.
4. Springs and Valve Trim: Stainless steel.
5. Normally closed.
6. Visual position indicator.
7. Electrical operator for actuation by appliance automatic shutoff device.
8. Manual reset.

B. Electrically Operated Valves: Comply with UL 429.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ASCO Power Technologies, LP; Division of Emerson.
 - b. Magnatrol Valve Corporation.
 - c. Parker Hannifin Corporation; Climate & Industrial Controls Group; Skinner Valve Div.
 - d. Watts Regulator Co.; Division of Watts Water Technologies, Inc.

2. Pilot operated.
3. Body: Brass or aluminum.
4. Seats and Disc: Nitrile rubber.
5. Springs and Valve Trim: Stainless steel.
6. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
7. NEMA ICS 6, Type 4, coil enclosure.
8. Normally closed.
9. Visual position indicator.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Meter Company.
 - b. Fisher Control Valves and Regulators; Division of Emerson Process Management.
 - c. Maxitrol Company.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Pressure rating as required per system design see drawings

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Eaton Corporation; Controls Div.
 - b. Harper Wyman Co.
 - c. Maxitrol Company.
 - d. SCP, Inc.
2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Pressure rating as required per system design see drawings

2.7 DIELECTRIC FITTINGS

A. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Hart Industries International, Inc.
 - d. McDonald, A. Y. Mfg. Co.
 - e. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
 - f. Wilkins; Zurn Plumbing Products Group.
2. Minimum Operating-Pressure Rating: 150 psig.
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for natural gas.
5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

B. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico Inc.

- c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
2. Minimum Operating-Pressure Rating: 150 psig.
 3. Companion-flange assembly for field assembly.
 4. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or PE bolt sleeves, phenolic washers, and steel backing washers.
 5. Insulating materials suitable for natural gas.
 6. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.8 SLEEVES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.9 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 2. Sealing Elements: interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
 3. Pressure Plates: Stainless steel.
 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

2.10 ESCUTCHEONS

- A. General Requirements for Escutcheons: Manufactured wall and ceiling escutcheons and floor plates, with ID to fit around pipe or tube, and OD that completely covers opening.
- B. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with polished chrome-plated finish.

- C. One-Piece, Cast-Brass Escutcheons: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Escutcheons: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.
- E. One-Piece, Stamped-Steel Escutcheons: With set screw and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Escutcheons: With concealed hinge, set screw or spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Escutcheons: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Escutcheons: Cast brass with concealed hinge and set screw.

2.11 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

2.12 LABELING AND IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

- B. Inspect natural-gas piping according to NFPA 54 or Local Code requirements to determine that natural-gas utilization devices are turned off in piping section affected.
- C. Comply with NFPA 54 or the Local Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 or the Local Code requirements for installation and purging of natural-gas piping.
- B. Steel Piping with Protective Coating:
 - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
 - 3. Replace pipe having damaged PE coating with new pipe.
- C. Install fittings for changes in direction and branch connections.
- D. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
- E. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 INDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 or the Local Code requirements for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Locate valves within arm's reach of catwalk platforms for easy access. Install all pipe valves above horizontal plane or in vertical rise.
- G. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install escutcheons at penetrations of interior walls, ceilings, and floors.
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Piping at Wall, Ceiling and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
- K. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- L. Verify final equipment locations for roughing-in.
- M. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- N. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets and all equipment connections. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- O. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- P. Conceal pipe installations in pipe spaces, utility spaces, and above ceilings.
- Q. Concealed Location Installations: Except as specified below, install concealed natural-gas piping in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. Prohibited Locations:
 - a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - b. Do not install natural-gas piping in solid walls or partitions.
- R. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- S. Connect branch piping from top or side of horizontal piping.
- T. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- U. Do not use natural-gas piping as grounding electrode.
- V. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

3.5 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance.
- B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.6 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints (**Above Ground Only**) :
 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 2. Cut threads full and clean using sharp dies.
 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
 5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.

3.8 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

- A. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for piping and valve identification.

3.10 PAINTING

- A. Comply with requirements in Division 09 painting Sections for painting interior and exterior natural-gas piping.
- B. Paint metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
 - 1. Alkyd System: MPI EXT 5.1D.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c. Topcoat: Exterior alkyd enamel (semigloss).
 - d. Color: Safety Yellow.

- C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Test, inspect, and purge natural gas according to NFPA 54 or Local Code requirements and authorities having jurisdiction.
- C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.12 OUTDOOR PIPING SCHEDULE

- A. Aboveground natural-gas piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints, 2" and smaller diameter.
 - 2. Steel pipe with wrought-steel fittings and welded joints, 2 1/2" and larger diameter.

3.13 INDOOR PIPING SCHEDULE:

- A. Aboveground piping 2" and smaller shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.

3.14 INDOOR PIPING SCHEDULE:

- A. Aboveground, piping 2 1/2" and larger shall be one of the following:
 - 1. Steel pipe with wrought-steel fittings and welded joints.

3.15 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe sizes NPS 2 and smaller shall be listed for use with natural gas and shall be one of the following:
 - 1. Two-piece, full-port, bronze ball valves with bronze trim.
- B. Valves for pipe sizes NPS 2-1/2 and larger shall be listed for use with natural gas and shall be one of the following:
 - 1. Two-piece, full-port, bronze ball valves with bronze trim.

2. Bronze plug valve.

END OF SECTION 231123

SECTION 260010 – GENERAL ELECTRICAL PROVISIONS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The work included consists of all supervision, labor, materials, equipment, facilities and installation required for the complete, satisfactory and approved Electrical Systems as indicated on the Contract Documents and called for in this Specification, or as may be reasonably implied by either for the installation of a complete Electrical System.
- B. All notes on the Drawings pertaining to the work of this Trade shall be considered as part of this Specification and Contract.
- C. In general, the Electrical Contractor shall make final connections to equipment furnished by other trades or by owner.
- D. Refer to entire Contract Documents for coordination and demolition.
- E. Contractor shall confirm existing utilities are capped or shutdown prior to excavation or demolition.
- F. Contractor must notify Owner two weeks (14 calendar days minimum) prior to excavation and exercise due caution with regard to disturbance of utilities and service.
- G. Contractor shall be held responsible for any damage and restoration to utilities and services. Restoration shall be made expeditiously with methods and materials that are approved for the intended use. Provide written report to the Owner detailing occurrence and corrective action.
- H. Contractor must coordinate and include with bid all indicated service requirements including site installation.
- I. The locations of existing underground utilities are shown in an approximate way only and have not been independently verified by the Owner or its representative. The Contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damage which might be occasioned by the Contractor's failure to exactly locate and preserve any and all underground utilities. Contractor is responsible for including all demolition and reroute, reinstallation costs in bid.
- J. It is the Contractor's responsibility to visit the job site to inspect and confirm field conditions and systems. Advise Consultant of inconsistencies prior to bidding (14 calendar days minimum).
- K. The Contractor shall install complete and operating Electrical Systems consisting of the following:

1. Complete distribution for power, signal, and control indicated on plans, including switches and circuit breakers, feeders, sub-feeders, panelboards, branch circuits, control wiring, switches and receptacles and all other equipment shown on drawings. Provide 5' of spare conductor cable at each end of raceway for termination purposes. Provide all cabling unless noted otherwise. All conductors, bussing, connections and components shall be copper.
2. Connection of all motors, electrically operated equipment and controls furnished under this or any other Division of these Specifications.
3. All conduits, sleeves and backboards, and terminal cabinets required for all systems.
4. Furnishing and installation of all electrical equipment, hardware, devices, etc.
5. Temporary electrical power and lighting shall be furnished, installed and maintained for all trades. Provide meter for billing allocation as may be necessary. Coordinate with Owner prior to bid as to charge back to Contractor for electric power usage reimbursement to Owner.
6. Painting shall be as specified in other Sections of these Specifications (See "Painting" Section), except that all exposed raceways, fittings, boxes, supports, panelboards, etc., shall be prepared for painting by removing all oil, grease, dirt, etc.
 - a. The Contractor shall employ the necessary precautionary methods to prevent painting over or obscuring any and all devices. The painting of panelboards, motor controllers and similar electrical apparatus shall be limited to touching up any surface scratches or marred during shipment or erection. The materials used shall match exactly the surface being touched up.
7. Miscellaneous items obviously required for a complete and operating system, but not specifically called for on the drawings or in the specifications, shall be provided by the Contractor at no extra cost to the Owner (nuts and bolts, masonry anchors, conduit and equipment supports, drilling, welding, scaffolding, crane service, etc.).
8. Required demolition and removal and re-installation of specific existing fixed equipment including but not limited to: (coordinate through Architect/Owner).
 - a. Mechanical Equipment.

PART 2 – PRODUCTS

(Not Applicable To This Section)

PART 3 – EXECUTION

(Not Applicable To This Section)

END 260010

SUBMITTAL IDENTIFICATION SHEET

PROJECT: _____
CONTRACTOR: _____ SUBCONTRACTOR: _____
SPECIFICATION REFERENCE: _____ ITEM: _____
NO. OF PAGES OF SUBMITTAL: _____ MODEL NO: _____
MANUFACTURER: _____ IS ITEM AS SPECIFIED: _____
REQUEST OF SUBSTITUTION: _____

OPTIONS/ACCESSORIES INCLUDED: _____

DEVIATIONS FROM SPECIFICATIONS: _____

ADDITIONAL REMARKS: _____

ENGINEER'S COMMENTS: _____

CONTRACTOR'S REVIEW STAMP

HANSON PROFESSIONAL SERVICES INC. (HANSON) SHOP DRAWING, PRODUCT DATA OR SAMPLE REVIEW	
<input type="checkbox"/> No Exceptions Taken	<input type="checkbox"/> Revise and Resubmit
<input type="checkbox"/> Furnish as Corrected	<input type="checkbox"/> Rejected – See Remarks
<p>Hanson's review of submittals is solely for their general conformance with Hanson's design intent and general conformance with information given in the construction documents. Hanson's markings or comments shall not be construed as relieving the Contractor from compliance with the project plans and specifications, nor departure therefrom. Hanson shall not be responsible for any aspects of a submittal that affect or are affected by means, methods, techniques, sequences and operations of construction, or safety precautions and programs incidental thereto, all of which are the Contractor's responsibility. The Contractor shall be responsible for lengths, weights, dimensions, elevations, quantities, etc., and coordination of the work with other trades. The Contractor shall be responsible to review all submittals and approve them in these respects.</p>	
By: _____	Date: _____

SECTION 260050 – BASIC ELECTRIC MATERIALS AND METHODS

PART 1 – GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor to provide:
 - a. Electrical work shown on the Electrical Drawings and specified herein.

1.2 RELATED WORK

A. Division 1 - Drawings and general provisions of Contract, including but not limited to, General, Special and Supplementary Conditions and other Division-1 Specification Section, apply to the work of this Section.

1. Division 23 - All applicable sections.
2. Division 26 - All applicable sections.

1.3 QUALITY ASSURANCE

- A. All work and materials shall be in accordance with the requirements and codes of the State of Florida, and all other applicable bodies having jurisdiction.
- B. If, in the opinion of the Contractor, any part of the specification or plans do not comply with the laws, codes and regulations, that matter shall be referred in writing to the attention of the Architect/Engineer for a decision before proceeding with that part of the work. There shall be no changes in the drawings or specifications made without written approval of the Architect/Engineer. Where a discrepancy exists between the drawings and this specification, the more stringent shall apply.
- C. Bidders shall visit the site and familiarize themselves with existing conditions and satisfy themselves as to the nature and scope of the work and the difficulties that attend its execution. The submission of a bid will be construed as evidence that such an examination has been made and that the existing conditions have been allowed for in the bid.
- D. Before ordering any material or doing any work, examine applicable Architectural, Civil, and Structural drawings, and Electrical and Mechanical and Equipment drawings, and verify all conditions of the project. Any differences that occur between drawings or between them and the specifications, or between both of these and actual

field measurement shall be reported in writing to the Consultant and written instructions for changes shall be obtained before proceeding with work.

1.4 REFERENCES TO STANDARDS

A. All materials and equipment furnished and installed under this contract shall be in accordance with the latest governing edition of the following applicable technical society, organization or body.

1. UL Underwriter's Laboratories, Inc.
2. NFPA-70 National Electrical Code.
3. NFPA-72 National Fire Alarm Code.
4. NFPA-780 Lightning Protection Code.
5. NFPA-101 Life Safety Code.
6. NFPA-110 Emergency and Standby Power Systems.
7. 4A-3, F.A.C. The State Fire Prevention Code (1990 edition)
8. Florida Building Code
9. Accessibility Requirements Manual, effective January 1, 1990 (Florida Department of Community Affairs).
10. NEMA - National Electrical Manufacturers Association
11. ASTM - American Society for Testing and Materials
12. IEEE - Institute of Electrical and Electronic Engineers
13. ANSI - American National Standards Institute, Inc.

B. Reference to standards shall mean and intend the latest edition of such standards adopted and published at the date of bidding documents.

C. Materials and installations, as a minimum, shall conform with local and state codes and ordinances. Equipment, where applicable, shall be Underwriter's Laboratories, Inc., listed and shall conform to National Electrical Manufacturer's Association (NEMA) Standards. Do not reduce standards if quality and workmanship established by Drawings and Specifications do not meet or exceed any of these codes and ordinances.

1.5 SUBMITTALS

A. In accordance with Division 1.

1. Product Data
 - a. Fire Stopping Material
 - b. Conduit / Raceways
 - c. Disconnects
 - d. Fuses
 - e. Circuit Breakers
 - f. Conductors

2. Corrections or comments made on the shop drawings during the review do not relieve this contractor from compliance with requirements of contract documents, plans and specifications. Shop drawings will be checked for general conformance with the design concept of the project and general compliance with information given in the contract documents. Review of the shop drawings shall not relieve the contractor from responsibility for details and accuracy, confirming and correlating all quantities and dimensions, selecting fabrication processes, for techniques of assembly and construction, coordinating his work with that of all other trades, and performing his work in a safe and satisfactory manner. Review of shop drawings shall not permit any deviation from plans and specifications.
 3. Contractor shall submit 1/2" scale drawings showing layouts of each equipment room for Consultant review. Show elevations of panels, controls, etc., for all interior walls at 1/2" scale.
 4. Contractor shall submit point to point wiring diagram for all signal and control systems, control panels, terminal cabinets, etc., for Consultant review.
 5. Complete shop drawings shall be submitted as a "package" per each system. (i.e. product data, scale layouts, plans, wiring diagrams, etc).
 6. Contractor shall submit conduit/conductor runs for all systems showing intended routings for Consultant review.
 7. Shop Drawings shall indicate terminal identification, barrier strip layout.
 8. Submit complete shop drawings, per system, as a package.
- B. In accordance with Division 1, at the completion of the project, Contractor shall submit operating instructions and maintenance manuals. Submit model number, catalog information, technical data sheets, shop drawings, test reports, wiring diagrams, parts lists and maintenance instructions where applicable for each of the following items of equipment (minimum, but not limited to, equipment and systems).

The Contractor is specifically cautioned that the Owner is entitled to all operating and instruction manuals, wiring and schematic diagrams, and other technical documentation whereby repairs and maintenance by the Owner or its designated representative may be performed. Unwillingness to comply with this requirement shall be grounds for rejection of the use of that manufacturer.

1. Wiring Devices
2. Switchboards
3. Transformers
4. Circuit Breaker and Distribution Panelboards

5. Motor Starters and Controls
 6. Lightning Protection System
 7. Fire Alarm and Detection System
- C. Throughout the progress of construction, keep a complete and detailed record of all deviations in the electrical installation from that indicated on the Drawings, specifications and/or shop drawings. At the completion of the project and prior to final payment this marked set of drawings shall be submitted to the Architect/Engineer. As-Builts shall be legible and clearly indicating depths, dimensions of raceways from unknown points. Provide one mylar set of reproducible and three print sets to the Owner, certified and signed, by the Contractor as to their accuracy.
- D. Comply with the following for all work specified in Division 26. As-Built information shall be shown to scale, using standard symbols listed in the legend. As a minimum show the following:
1. Location of stub-outs and dimensions from permanent building lines.
 2. All routing of raceways, dimensions from building.
 3. Corrected panelboard and equipment schedules.
 4. Corrected circuit numbers as they appear on panelboard directories.
 5. Corrected motor horsepower and full load amperages.
 6. Number, size, type of insulation and number of wires in each conduit or multiconductor cable whether in conduit or exposed.
 7. Location of junction boxes and splices.
 8. Location of access panels.
 9. Conduit/wiring for all communication, signals systems.

1.6 TEMPORARY ELECTRICAL SERVICES

- A. In accordance with Division 1.
- B. Provide temporary lighting for safety and security throughout the Project.
- C. Provide temporary power for construction needs throughout the project. Coordinate through utilities for services.

1.7 GUARANTEE

- A. Guarantee all materials and workmanship for a period of one (1) year in accordance with the General Conditions.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be suitably packaged by manufacturer to prevent damage during shipment. Damaged materials will not be acceptable for use.
- B. Store materials on site in clean, dry storage area; when outside, elevated above grade and enclosed with durable watertight wrapping.
- C. Handle all materials carefully to prevent damage. Minor scratches, marks or blemishes to finish shall be repaired by Contractor.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General

1. All equipment and material for permanent installation shall be new unless specifically indicated otherwise. In addition material shall:
 - a. Be without blemish or defect.
 - b. Not be used for temporary power or lighting without prior written authorization from the Owner.
 - c. Be in accordance with NEMA Standards.
 - d. Bear Underwriter's Label where subject to U.L. label service.
 - e. Be U.L. listed for its intended service and application.
2. Equipment and materials of the same type of classification and used for the same purposes, shall be products of the same manufacturer.
3. Materials and equipment shall conform in all respects to the requirements set forth in these specifications and the accompanying drawings. However, wherever a product is identified by name, equal products which meet the Owners/Consultant's written approval may be used (per contract document procedures). A minimum of 14 calendar days prior approval will be required.
4. Except as otherwise specified, materials and equipment shall be new and bear the approval label of Underwriter's Laboratories, Inc.
5. Where equipment and materials are specified or designated on drawings by trade names and catalog numbers, the intent is to establish a standard of quality, appearance, performance and dimension. Materials and equipment of other manufacturers will be considered, provided they are equal in all respects to that specified. However, it will be the Contractor's responsibility to demonstrate equality of substitution with materials or equipment specified by the Consultant.

Substitutions shall require a minimum of 14 calendar days prior approval and be subject to Division 1. Compensations for "as-built" drawings or contract documents requiring additional engineering services due to Contractor substitutions shall be paid directly by the Contractor to the Consultant. The Consultant shall be compensated by the Contractor for multiple reviews (more than two) of any shop drawing submission.

B. Fire Stopping Material

1. Fire stopping materials shall consist of commercially manufactured products capable of passing ASTM E-814 (UL 1479) Standard Method of Fire Test for Through Penetration Fire Stops.
2. Provide fire stopping materials to maintain the rating of the wall, partition or floor opening that penetration is made.
3. Fire stopping materials shall be U.L. classified.
4. Acceptable Products
 - a. 3M - Fire Barrier
 - b. Thomas & Betts - Flame Safe
 - c. Nelson Electric - Flameseal
 - d. IPC

C. Water Seal

1. Seal penetrations of perimeter walls or floors below grade to prevent entry of water. Use materials compatible with wall or floor construction.
2. Seal penetrations of roof, with flashings compatible with roof design.

D. Nameplates

1. General: Furnish and install nameplates wherever indicated as "required" in these specifications. Wording shall be submitted to the Architect/Engineer for review prior to purchase of nameplates.
2. Material: 1" high black phenolic engraving stock, white core.
3. Lettering: Engraved. Approximately 1/2 inch high for floor mounted equipment and 3/16 inch high for wall mounted equipment. Wording shall identify function of device to which nameplate is attached or identify equipment serviced by device.

4. Provide red labels with white lettering at all flush-plates, switches, outlets, devices, equipment, etc. connected to the emergency or essential electrical systems or services.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. All equipment and materials shall be installed and completed in a first-class workmanlike manner. The right is reserved to direct the removal and replacement of any item, which in the opinion of the Owner's Representative and/or Architect/Engineer does not present an orderly and reasonably neat or workmanlike appearance, provided such items can be properly installed in an orderly way by usual methods in such work. The right is also reserved to require the removal of items and/or installations which do not conform to the Contract Documents.
- B. Electrical drawings are diagrammatic but shall be followed as closely as actual construction of the building and the work of other trades will permit. Consult Architectural drawings and details for exact location of fixtures and equipment and buildings element dimensions. Because of the small scale of drawings, it is not possible to indicate all of the offsets, fittings and accessories required. This subcontractor shall investigate the structural and finish conditions affecting his work and shall arrange such work accordingly, providing fittings, bends, junction boxes, pull boxes, access panels and accessories required to meet such conditions. Conduit/ductbank layouts, locations are to be coordinated with all Contractors by the Division 26 Contractor. Locations are approximate and the Division 26 Contractor shall allow for field adjustment. Additional monies will not be approved for field conditions or lack of coordination on the part of the Contractor.
- C. No deviations from the plans and specifications shall be made without the full knowledge and consent of the Consultant. Should the Contractor find at any time during the progress of the work that, in his judgment, a modification of the requirements of any particular item is needed; he shall report such item promptly to the Consultant for his decision and instruction.
- D. Discrepancies in Electrical and Mechanical Drawings - it is recognized that locations of piping, ductwork, etc., shown on Mechanical and Electrical drawings are diagrammatic, except for figured dimensions, and that field conditions may arise that will prevent their being installed as noted on drawings, such as runs of pipe cross-overs, risers, panelboards, electric outlets, machinery, etc., within limits established by figures on Architectural Drawings. It is the duty of each and every subcontractors to consult with each other, verifying existing conditions and in each case where there is any question or doubt as to space conditions or location of outlets, etc., to submit a timely workable solution to the Consultant for their approval before installing any work which is questionable.

- E. The Contractor is specifically directed to the mechanical section of the contract documents for coordination.
- F. The Contractor shall refer to the entire set of contract documents for bidding purposes and completeness of proposal. Items not shown on the electrical project documents, but shown on mechanical requiring wiring, components, raceways, etc., must be included in bid proposal to provide a complete working system. Systems and devices shown on one portion of documents shall be as if they apply to all portions of the contract documents.
- G. The Contractor (including electrical subcontractor) shall, prior to rough-ins, confirm all location of device with owner representative and architect. Coordinate with architectural drawings interior elevations for exact locations, mounting heights, dimensions for installation of all items. Coordinate with wall coverings, furniture, etc.
- H. Install all equipment in accordance with manufacturer's recommendations.
- I. Provide all necessary anchoring devices and supports.
 - 1. Use structural supports suitable for equipment, or as indicated.
 - 2. Check loadings and dimensions of equipment with shop drawings.
 - 3. Do not cut or weld to building structural members.
- J. Verify that equipment will fit support layouts indicated.
 - 1. Where substitute equipment is used, revise indicated supports to fit.
- K. Arrange for necessary openings to allow for admittance of equipment.
 - 1. Where equipment cannot be installed as structure is being erected, provide and arrange for building-in of boxes, sleeves or other devices to allow later installation.
- L. Make all penetrations through roofs prior to installation of roofing. For penetrations required after installation of roofing:
 - 1. In built-up roofing (BUR), provide all curbs, cants and base flashings.
 - 2. In elastic sheet roofing (ESR), arrange and pay for base flashing work by authorized roofer.
- M. Install rain hoods and metal counter flashings as indicated and make all penetrations for electrical work through walls and roofs water- and weather-tight.
 - 1. Furnish all clamps, waterproofing material and labor necessary.

2. Where metal flashings are applied over concrete, paint concrete with 1/8 inch of mastic cement first.
 3. Set flashing in mastic cement, watertight.
- N. Repair and replace roof construction, damaged by this work, in manner which will not nullify roof guarantee.
- O. Provide equipment guards at all belts, couplings, moving machinery and equipment provided under this division in accordance with OSHA.
1. Use suitable structural frames with 12 gauge, 3/4" maximum opening galvanized mesh, or expanded metal mesh.
 2. Attach to equipment by removable clips and bolts with wing nuts, or other approved connectors.
- P. Install equipment to permit easy access for normal maintenance.
1. Maintain easy access to switches, motors, drives, pull boxes, receptacles, etc.
 2. Relocate items which interfere with access.
- Q. Provide concrete foundations or pads required for electrical equipment, as indicated or as follows:
1. Where drawings do not show special foundations, install 4 inch high concrete pads.
 2. Use 3,000 PSI concrete.
 3. Reinforce with 6 x 6 x 10 x 10 mesh, with short dowels into floor at 12 inch OC around perimeter.
 4. Chamfer top edges 3/4 inch
 5. Rub all faces smooth with carborundum block.
 6. Set anchor bolts for equipment.

3.2 LOCATION OF EQUIPMENT

- A. The approximate location of all equipment and devices is shown on the Drawings. The Owner's Representative and/or Architect/Engineer reserves the right to change the location of all equipment or devices 6 feet in any direction at no additional cost provided such changes are requested before final installation.
- B. Install all equipment with ample space allowed for removal and repair meeting manufacturer's recommendations and code requirements. Provide ready accessibility to removable parts of equipment and to all wiring without moving equipment which is installed or which is already in place. Provide access panels for all devices installed above non-accessible ceilings and/or within walls or partitions.

- C. In mechanical and electrical equipment spaces, expose ceiling outlets and conduit with due consideration to ventilating ducts and mechanical piping. Where numerous ducts occur, install conduits and outlets after the ventilating ducts. Puncturing of duct work or hanging equipment such as light fixtures, ceiling hangers and conduits from duct work is prohibited. Submit "comprehensive" shop drawings for every mechanical, electrical room, ¼" scale plans, elevations. Contractor is cautioned to include all costs in bid to provide all required electrical systems complete in mechanical spaces. Contractor may locate starters, switches, etc. to coordinate with field construction, but must maintain clearances, performance, and accessibilities.
- D. Electrical equipment shall be installed to maintain minimum clearances per Article 110 of the NEC and ANSI C2 (National Electrical Safety Code and recommendations of manufacturer/vendor).
- E. Dimensions indicated on documents are limiting dimensions. Do not provide equipment exceeding dimensions indicated or equipment/arrangements that reduce required clearances or exceed specified maximum dimensions.

3.3 COORDINATION

- A. Provide day-to-day coordination with the work of other contractors engaged in this project. Execute the work in a manner not to interfere with other contractors.
- B. Coordinate with other contractors regarding the location and size of pipes, raceways, ducts, openings, and devices, so that there may be no interferences between installations or the progress of any contractor.
- C. If conflict arises in the installation of work, the following preference schedules shall be followed:
 - 1. Recessed lighting fixtures.
 - 2. Sanitary drainage.
 - 3. Steam condensate, hot and chilled water piping.
 - 4. Low pressure ductwork.
 - 5. Domestic water, storm and vent lines.
 - 6. Electrical conduits.
- D. This Contractor shall notify all other contractors of any deviations or special conditions necessary for the installation of his work. Interferences between the work of various contractors shall be resolved prior to installation. Work installed not in compliance with the plans and specifications and without properly checking and coordinating as specified above shall, if necessary, be removed and properly reinstalled by this Contractor without additional cost to the Owner. The Consultant or his representative shall be the mediating authority in all deviation and confliction disputes arising on the project.

- E. Insofar as it is possible to determine in advance, this Contractor shall consult with the masonry contractor and others as to leaving the proper chases and openings for his work; and he shall place all of his outlets, anchors, sleeves and supports prior to pouring concrete or masonry work. Should this Contractor neglect doing this, any cutting and/or patching shall be done at this Contractor's expense.
- F. Contractor must notify Owner prior to excavation and exercise due caution with regard to disturbance of utilities and services.
- G. Contractor shall be held responsible for any damage and restoration to utilities and services. Restoration shall be made expeditiously with methods and materials that are approved for the intended use. Provide written report to the Owner detailing occurrence and corrective action.
- H. The locations of existing underground utilities are shown in an approximate way only and have not been independently verified by the Owner or its representative. The Contractor shall determine the exact location of all existing utilities before commencing work and agrees to be fully responsible for any and all damage which might be occasioned by the Contractor's failure to exactly locate and preserve any and all utilities.
- I. Contractor shall provide proposed solution for field request coordination concerns for architect review. Requests for information and resolution shall be submitted so as to not delay projects and provide architect 5 days minimum review time, or as specified in Division 1.

3.4 WALL, ROOF AND FLOOR PENETRATIONS AND SLEEVE INSTALLATION

- A. Provide sleeves for all electrical raceways, and wiring passing through walls and floors and roof. Sleeves shall be of sufficient length to extend through the wall, roof and floors. Wall sleeves shall have ends flush with finished thickness of walls and floor sleeves shall extend 1 inch above finish floor. Interior diameter of sleeves shall provide 1/2 inch clearance all around conduit.
- B. Set all wall, roof and floor sleeves during the construction of same in new construction.
 - 1. Structural concrete beams shall be sleeved only in the middle 1/3 of span. Notify Architect/Engineer of any required deviation from this prior to placement of sleeve.
- C. Roof penetrations shall be made watertight. Roof penetration shall be sealed and flashed per roof manufacturers published recommendations.

- D. Where cutting is required to facilitate construction, this contractor shall patch and repair cut items to the original state. However, structural work shall not be cut without the written approval of the Architect/Engineer or his representative.
- E. Holes through concrete and masonry in new and existing structures shall be cut with a diamond core drill or concrete saw. Pneumatic hammer impact, electric hand or manual hammer type drills, shall not be allowed, except where permitted by the resident engineer or as required by limited working space.
- F. Cutting and Patching
 - 1. Any routing damage caused by cutting or in any other way caused by this Electrical Contractor in the performance of his contract shall be repaired or replaced under the separate heading for the type material included in a manner satisfactory to the Architect.
 - 2. Any unnecessary damage caused by this Contractor, due to installation of the electrical work, brought about through carelessness or lack of coordination, shall be corrected under the separate heading for the type of materials involved, but paid for by his Contractor.
- G. Access Panels
 - 1. The Contractor's attention is called to access panels. It is a requirement of these specifications that all access panels required in architectural finishes or surfaces to provide access to junction boxes, smoke detectors, strip heaters, ballasts or other devices be provided and located by the trade constructing the base or frame to which the access panel will be anchored. Advise Consultant of locations, size of all panels. Coordinate utilities to minimize openings.

3.5 FIRESTOPPING

- A. Where conduits, wireway, bus duct and other electrical raceways pass through fire partitions, fire walls or walls and floors, install a firestop that provides an effective barrier against the spread of fire, smoke and gases. Fire-stop material shall be packed tight, and completely fill clearances between raceways and openings. Fire-stop material shall conform to the following:
 - 1. Fire-stopping material shall maintain its dimension and integrity while preventing the passage of flame, smoke and gases under conditions of installation and use when exposed to the ASTM #119 time-temperature curve for a time period equivalent to the rating of the assembly penetrated. Cotton waste shall not ignite when placed in contact with the non-fire side during the test. Fire-stopping material shall be non-combustible as defined by ASTM E136, and, in addition, for

insulation materials, the melting point shall be a minimum of 1700° F for 2-hour protection.

2. Unused, spare sleeves in electrical closets shall be sealed with threaded steel caps on each end.
- B. Fire stopping materials shall be installed in accordance with manufacturers written instructions.

3.6 PROTECTION OF WORK

- A. Protect work from mechanical damage by keeping all conduit and boxes capped and plugged or otherwise protected. This includes damage by freezing and/or stoppage from building materials, sand, dirt, or concrete.
- B. Protect all equipment and fixtures from damages during the project, provide all tarpaulins, drop cloths, barricades, temporary heaters or auxiliary equipment.
- C. All materials or equipment damaged during construction shall be repaired or replaced with new items to the satisfaction of the Architect/Engineer/Owner. Replacement shall be accomplished so as to not delay project schedules.

3.7 IDENTIFICATION

- A. Furnish and install approved permanent nameplates on all items of electrical equipment showing nature and function of each piece of equipment. This shall include switchboards, motor control centers, panels, motor starters, disconnect switches and motor control devices. Nameplates shall be fastened to devices (except for factory-installed nameplates) with sheet metal screws after finish painting of item has been completed.
- B. Identify above ceiling junction box covers with legible designation as to service, circuit numbers and/or system. This shall be done with permanent ink marker or method described elsewhere herein. Identify all other screw covered boxes, junction boxes, terminal cabinets with permanent engraved nameplates.
- C. Identify every conductor with "Brady Tags" or approved equivalent for maintenance, trouble shooting purposes. Identify at terminations and pullboxes, splice boxes, terminal cabinets, accessible areas.
- D. Tag all conductors and identify major conduits in or at wireway, panels, pull boxes, switchboards, motor controllers, cabinets and similar items to assist in future circuit tracing. Conductor tags shall be non-conductive.
- E. Identify all circuits and equipment to correspond with the plans and specifications.

- F. Use phenolic nameplates for panelboards, switchboards, disconnects, etc., or other approved methods except as indicated otherwise. Provide nameplate for manual transfer switch indicating the voltage, phase, type (Wye or Delta), and rotation.
- G. All junction boxes shall have type of system and voltage of contained conductors stenciled on inside, outside of box cover.

3.8 PAINTING

- A. Provide touch-up painting of all electrical equipment marred in any way during shipment or installation. Touch-up painting shall match electrical equipment factory painted color(s).

3.9 CONNECTIONS TO EQUIPMENT

- A. Equipment: The Contractor shall make final electrical connections to all items of equipment. All power wiring from power source through starters, disconnects and control panels to equipment shall be provided.

3.10 SAMPLES

- A. Physical samples of material and equipment proposed for installation in this project shall be submitted to Consultant upon request.
- B. Samples shall be submitted through the General Contractor with all shipping and handling charges prepaid. Any expense incurred in securing, delivery and return of samples, is the responsibility of Contractor. Samples shall be delivered to location designated by Consultant.
- C. Samples shall remain the possession of the Contractor except as follow:
 - 1. Approved samples, without physical damage, may be installed on the project.
 - 2. Samples not called for within 14 calendar days after notification will be disposed of by the Consultant.

3.11 SPARE PARTS AND TOOLS

- A. Furnish to Owner and obtain receipt for same, the following:
 - 1. One set of fuses for each size and type installed on project.
 - 2. One set of special tools required for equipment furnished, spare keys, etc.
 - 3. One spare smoke detector, heat detector, manual pull station, horn, strobe, and duct detector.

4. One set of overloads or heaters for each size and type motor starter installed on project.

3.12 FINAL INSPECTION AND TESTS

- A. As precedent to final inspection and acceptance, the Contractor shall have all previously listed defects corrected, complete all work, test all systems and have data on such tests, have all directories, labels and instructions posted, complied with applicable paragraphs of this section.

3.13 PERFORMANCE

- A. The Contractor shall employ a competent foreman on the job throughout the entire period of construction to see that his work will not conflict with other trades and that it is properly performed.
- B. The foreman shall have a thorough knowledge of the work to be installed under this contract, be a skilled mechanic experienced with projects of equal size and type. Foreman shall have valid County Journeyman license.

END 260050

SECTION 260110 – RACEWAYS

PART 1 – GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor to provide:
 - a. Feeders and branch circuit conduits for power and lighting systems, and for conductors of all other electrical systems. Install conduit complete with outlet boxes, junction or pull boxes, and fittings, shown on the drawings or herein specified.
 - b. Wireways with related fittings.
 - c. Surface metal multi-outlet raceway.
2. Temperature Control Contractor to provide:
 - a. Temperature control raceways.
3. General Contractor to provide:
 - a. Painting of exposed raceways.
 - b. Flashing and sealing of all raceway roof penetrations.

1.2 RELATED WORK

A. Specified Elsewhere:

1. Drawings and general provisions of Contract, including, but not limited to, General, Special, and Supplementary Conditions and other Division-1 Specification Sections, apply to the work of this Section.
2. Division 23 - applicable sections.
3. Division 26 - applicable sections.

1.3 QUALITY ASSURANCE

- A. Provide all new materials, without blemish or defect, in accordance with standards specified and UL listed or labeled.

1.4 SUBMITTALS

- A. Submit in accordance with Division 1.
- B. Product Data:

1. Conduit and fittings.
2. Wireway and related fittings.
3. Surface metal raceways.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Rigid steel conduit shall be sherardized or hot dipped galvanized steel pipe, bearing U.L. label and conforming to ANSI Publication C80-1.
 1. Acceptable Manufacturers:
 - a. Youngstown
 - b. Triangle – PWC
 - c. Republic
 - d. Allied Tube
- B. Couplings, connectors and fittings for rigid steel conduit shall be threaded galvanized steel or galvanized malleable iron specifically designed and manufactured for the purpose. Fittings shall conform to ANSI C80.4.
- C. Electrical metallic tubing (EMT) shall be U.L. listed and shall conform to ANSI Publication C80-3. Conduit shall be thoroughly protected from corrosion by electro-galvanizing.
 1. Acceptable Manufacturers:
 - a. Allied
 - b. Republic
 - c. Triangle - PWC
 - d. Youngstown
- D. EMT fittings shall be of the steel compression type, rain and concrete tight, with steel compression nuts. Connectors shall be insulated throat with case hardened locknuts. Fittings shall conform to ANSI C80.4
 1. Acceptable Manufacturers:
 - a. Appleton
 - b. Raco
 - c. Thomas and Betts
 - d. Efcor
- E. IMC conduit shall be threaded zinc coated steel tubing specified for Intermediate Metal Conduit (IMC) and shall conform to Underwriters' Laboratories, Incorporated Standard UL 1242. Do not use unless specifically noted on documents.

1. Acceptable Manufacturers:
 - a. Allied Tube
 - b. ETP
 - c. Triangle – PWC

- F. Aluminum conduit shall be prime 6063 alloy with T-42 temper and silicone coated inside. It shall meet ANSI Publication C80-5. Use only aluminum fittings with aluminum conduit. Do not use unless specifically noted on documents.
 1. Acceptable Manufacturers:
 - a. Reynolds Metals
 - b. VAW
 - c. New Jersey Aluminum

- G. Flexible conduit shall be hot dipped galvanized steel or aluminum flexible conduit. In areas where such connections will be exposed to grease, oil, water or weather, flexible liquid tight conduit shall be used. Comply with UL-1, and UL-360.
 1. Acceptable Manufacturers:
 - a. Anaconda
 - b. Electri-Flex
 - c. Triangle – PWC
 - d. International Metal Hose.

- H. Connectors shall be compatible with flexible conduit used and shall be UL listed for grounding means.
 1. Acceptable Manufacturers:
 - a. Midwest
 - b. Raco
 - c. Thomas and Betts
 - d. Appleton
 - e. O – Z Gedney
 - f. Efcor

- I. Plastic conduit shall be PVC Type EPC-40 Heavy wall rated for 90 deg. C cable meeting NEMA Standard TC-2, and UL listed for concrete encasement. Nonmetallic conduit fittings and conduit bodies comply with NEMA TC-3.
 1. Acceptable Manufacturers:
 - a. Carlon Products Company
 - b. Robintech
 - c. Can-Tex

- J. Wireways: Provide electrical wireways of types, and sizes as indicated. Provide complete assembly or raceway including, but not limited to, couplings, offsets, elbows, expansion joints, adapters, holddown straps, end caps, ceiling hangers, and other components and accessories as required for complete system.
1. Lay-In Type: Provide lay-in wireways with hinged covers, in accordance with UL 870 and with components UL listed, including lengths, connectors, and fittings. Select units to allow fastening hinged cover closed without use of parts other than standard lengths, fittings and connectors.
 2. Connectors: Provide wireway connectors suitable for "lay-in" conductors, with connector covers permanently attached so that removal is not necessary to utilize the lay-in feature.
 3. Finish: Protect sheet metal parts with rust inhibiting coating and baked enamel finish. Plate finish hardware to prevent corrosion. Protect screws installed toward inside of wireway with spring nuts to prevent wire insulation damage.
 4. Acceptable Manufacturer's:
 - a. Square D
 - b. Hoffman
 - c. Wiegmann
 - d. Walker
- K. Surface Metal Multi-Outlet Raceway: Multi-outlet assembly for prewired outlets, lengths as indicated. Provide 4-wire, two circuit grounding with outlets on 18" centers. Provide 15 ampere, 125 volt outlets, NEMA Type 5-15R. Raceway shall be prime coated for field painting. Outlets shall be ivory color.
1. Acceptable Products:
 - a. Wiremold – Plugmold 2000
 - b. Walker – Walkermold 2GW Series
- L. Multi outlet two piece surface metal raceway systems shall consist of steel raceway components with factory applied gray finish. Provide center divider strip for separation between power and communications. The system is to be furnished with receptacles at spacings shown on the drawings. Raceway shall be UL listed. Furnish with all standard accessories for a complete installation.
1. Acceptable Products:
 - a. Wiremold G-4000
 - b. Walker 3400
- M. Grounding Bushings: With screw termination for green bond wire.

1. Provide per NEC, all areas

PART 3 – EXECUTION

3.1 INSTALLATION

A. Conduit Schedule

1. Minimum conduit size shall be 3/4 inch unless otherwise specified.

B. Conduit shall be installed in accordance with the following:

1. All conduits in or below floor slabs shall be RGS or PVC and in masonry and concrete walls shall be rigid steel. All rigid steel conduit routed underground or in the concrete slab shall be painted with two coats of bitumastic compound. Provide RGS "EL"s in all raceways stubbing through slabs.
2. All branch circuit conduits in stud partitions and drop ceiling areas, and exposed 4 feet above finish floor may be EMT (thinwall) conduit.
3. All exposed motor, heater branch circuit conduits shall be rigid steel. EMT conduit may be used provided the conduit is adequately protected and it is not installed in the slab or underground.
4. Conduit systems for telephone, fire alarm, and miscellaneous systems shall consist of EMT (thinwall) conduit in drop ceilings, and stud wall partitions and exposed 4 feet above finish floor. All other conduit shall be rigid steel.
5. PVC conduit may be utilized for underground applications, subject to limitations as specifically noted on drawings or within specifications.
6. Flexible conduits shall be used as herein specified.
7. Rigid aluminum conduit, IMC may be used only if specifically noted. Do not use underground or embedded in concrete.
8. Provide metallic raceways, conduits only for sound, theatrical lighting systems, dimming systems, and fire alarm systems.

C. Conduit Runs

1. All conduit shall be sized as indicated on the Drawings, or for conduit sizes not shown shall be in accordance with the National Electrical Code. All conduit systems shall be mechanically and electrically continuous from source of current to all outlets and grounded in accordance with the National Electrical Code.

2. Conceal conduit wherever possible, or expose as shown or noted on the drawings and as specified hereinafter. Run all exposed conduit parallel to building walls using right angle bends. Exposed diagonal runs of conduit will not be permitted. Do not install conduit on roof surfaces unless specifically indicated on the Drawings. Contractor shall run all raceways concealed within walls in all finish areas.
3. Any conduit installed in concrete slabs shall be located such that it will not adversely affect the structural strength of the slab. Install conduit within the middle one-third of the slab. The outside diameter of any conduit run in concrete slabs shall not exceed one-third of the thickness of the slab. Where embedded conduits cross expansion joints, provide suitable watertight expansion fittings and bonding jumpers. Conduit larger than one inch trade size shall be parallel with or at right angles to the main reinforcement; when at right angles to the reinforcement, the conduit shall be close to one of the supports of the slab. Space conduit horizontally not closer than three diameters, except at stub-up locations. Do not stack. Curved portions of bends shall not be visible above the finish slab.
4. Encase primary, secondary service entrance and telephone conduits in 3 inch concrete envelope coverage, 2" concrete between raceways.
5. Install conduit at least 12 inches from gas, steam or hot water piping parallel runs, at least 6 inches in cross runs and at least 3 inches from cold water piping.
6. Ream conduit after threads are cut. Cut ends square, and butt solidly into couplings.
7. Prevent the accumulation of water, foreign matter or concrete in the conduits during the execution of the work. Temporarily plug conduit, blowout and swab before wires are pulled. Seal all below grade raceways terminating in handhole, etc.
8. Where insulated bushings are used, fasten conduits to all sheet metal boxes and cabinets with two locknuts in accordance with NEC.
9. Provide conduit expansion joints at building expansion joints for conduit runs 1-1/2 inches and larger. Provide conduit expansion joints or flexible conduit connection at building expansion joints for conduits less than 1-1/2 inches.
10. Seal each underground joint and make watertight.
11. Where building construction or other conditions make it impossible to use standard threaded couplings, install watertight threaded unions.
12. Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with conduit bending machine to avoid changing the internal diameter of the conduit and not damage its protective coating either inside or outside. Individual bends shall not exceed 90 degrees and not more than 270 degrees total bends will be allowed in any one conduit run. Where more bends are necessary, and conduit runs exceed 150 lineal feet, install a suitable pull box or junction box.

13. Provide empty conduits installed with a pull wire. Pull wire shall be No. 14 AWG zinc-coated steel, or of plastic having not less than 200 pound tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.
14. Use liquid tight flexible conduit for final connection to motors, portable equipment and for equipment subject to vibration and noise transmission. For each conduit size up to 1 inch trade size, flexible conduit shall be minimum length of 12 inches and a maximum length of 36 inches. For conduit sizes above 1 inch trade size, flexible conduit shall be minimum length of 20 inches and maximum length of 48 inches.
15. Use flexible metal conduit to connect fixtures to adjacent junction boxes where not an integral part of the fixture. Flexible conduit shall be a minimum 1/2 inch trade size, minimum 4 feet long and maximum 6 feet long nominal. Support all flexible metal raceway with approved clips.

D. Wireway Routing

1. Install continuous as indicated.
2. Install level and parallel to building services.
3. Changes in direction and elevation to be accomplished with factory furnished offsets and corners.
4. Layout, assemble on job, and coordinate wireway system with work of other crafts to avoid conflicts.

E. Raceway Support and Hangers

1. Securely fasten raceways in place and support from ceiling or walls at spacings not exceeding:

Material	Maximum Spacing of Supports
a. 1/2" thru 1" trade size conduit	6 feet
b. 1-1/4" thru 1-1/2" trade size conduit	8 feet
c. 2" to 4" trade size conduit	10 feet
d. Flexible Metal Conduit	4-1/2 feet
e. Wireways	5 feet
f. Cable Tray	10 feet

2. Support rigid, IMC or EMT conduits within 3 feet of every outlet box, junction box, pull box, cabinet or termination. Support flexible conduit within 12 inches on each side of every outlet box or fitting.
3. Support vertical runs of conduits at each floor level and at intervals not to exceed 10 feet.

4. Support conduits by pipe straps, wall brackets, hangers, or ceiling trapeze. The use of perforated iron or wire for supporting conduits is prohibited. Fasten with wood screws or screw nails to wood; by toggle bolts on hollow masonry units, by concrete inserts, or expansion bolts on concrete or spring-tension or threaded C-clamps for rigid steel conduits on steel. Do not weld conduits or pipe straps to steel structures unless specifically indicated.
5. Fasteners attached to concrete shall be vibration and shock resistant.
6. Use caddy-clips or approved listed supports for box, raceways support within stud walls. The load applied to fasteners shall not exceed one-third the proof test load of the fasteners.
7. In suspended-ceiling construction, spring steel fasteners to ceiling supports may be used for the support of flexible raceway serving lighting branch circuit conduits. No other conduits may be supported from the ceiling suspension system.
8. Where two or more conduits one inch trade size or larger run parallel, trapeze hangers may be used, spaced to match smallest conduit consisting of threaded solid rods, washers, nuts and galvanized "L" angle or channel iron. Individually fasten conduits to the cross member of every other trapeze hanger with one hole straps or clamp backs with proper size bolts, washers and nuts. When adjustable trapeze hangers are used, use U-bolt type clamps at end of conduit runs, at each elbow and at each third intermediate hanger to fasten each conduit.
9. Make hangers of durable materials suitable for the application involved. Applied loads shall not exceed one-third of their loading capacity.
10. Fabricate all screws, bolts, washers and miscellaneous hardware used for conduit supports from rust-resisting metal. Trapeze hangers shall have hanger assemblies protected with galvanized finish.

3.2 SPECIAL INSTALLATION

A. Hazardous Locations

1. Perform all work in hazardous locations as defined by the NEC in strict accordance with the NEC for the particular "Class", "Division", and "Group" of hazardous locations involved or indicated on the drawings. Provide conduit and cable seals in accordance with the NEC.

B. Telephone, Data Systems

1. Provide a 1"C. stub with insulated bushings on each end from each outlet to a location above an accessible ceiling for cable runs to the terminal board.

2. Provide screw covered box a minimum of every 100 LF or 180° total bends, size 12x12x6, minimum, where complete conduit runs are required or otherwise necessary.
3. Where applicable, provide bend radius minimum 6x conduit diameter for 2" and less, 10x conduit diameter 2½" and greater.

END 260110

SECTION 260120 - WIRES & CABLES

PART 1 – GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor to provide:
 - a. Wires and cables including splices, connections and supports for a complete installation as shown on the drawings and specified.
2. Temperature Control Contractor to provide:
 - a. Wiring for all temperature control work.

1.2 RELATED WORK

A. Specified Elsewhere:

1. Drawings and general provisions of Contract, including, but not limited to General, Special, and Supplementary Conditions and other Division-1 Specification Sections, apply to the work of this Section.
2. Division 23 - applicable sections
3. Division 26 - applicable sections

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Wire, cable and installation thereof shall be in accordance with the National Electrical Code.
2. All materials shall be new, without blemish or defect, in accordance with standards specified and UL listed or labeled.

1.4 REFERENCES

- A. ICEA S-61-402/NEMA WC-5 Thermoplastic Insulated Wire and Cable
- B. ICEA S-66-524/NEMA WC-7 - Cross-Linked Thermosetting Polyethylene - Insulated Wire and Cable.
- C. NEMA WC-41 - Coaxial Communication Cable.

1.5 SUBMITTALS

- A. In accordance with Division 1.
- B. Provide product data for all components.
 - 1. Building wire.
 - 2. Communications, controls wire.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be suitably packaged by manufacturer to prevent damage during shipment. Damaged materials will not be acceptable for use.
- B. Store materials on site in clean, dry storage area.
- C. Handle all materials carefully to preclude damage. Material with damaged insulation shall not be acceptable for use.

PART 2 – PRODUCTS

2.1 BUILDING WIRE

- A. All wire and cable shall be annealed, coated copper per ASTM B 33 or B 189 with conductivity of not less than 98 percent. All wire shall be stranded, Class B per ASTM B8.
- B. All wire shall have 600 volt insulation, UL listed and complying with UL 83, ICEA S-61-402 or ICEA S-66-524 for respective insulation type.
- C. Service entrance, feeders and branch circuits larger than No. 6 AWG: 600 volt insulation Type XHHW or THWN.
- D. Feeders and branch circuits No. 6 AWG and smaller: 600 volt insulation Type THHN or THWN, unless otherwise noted.
- E. Control circuits: 600 volt insulation, THWN.
- F. Color code conductor insulation for No. 8 AWG or smaller. Provide color marking tape for No. 6 AWG and larger. Standard colors for power wiring and branch circuit:

208Y/120 V	3 Phase	480Y/277 V	3 Phase
Phase A	Black	Phase A	Brown
Phase B	Red	Phase B	Orange
Phase C	Blue	Phase C	Yellow
Neutral	White	Neutral	Natural Grey
Ground	Green	Ground	Green

G. Acceptable Manufacturers:

1. Anaconda Wire & Cable Co.
2. Collyer Insulated Wire Co.
3. General Cable Corp.
4. Phelps Dodge Cable & Wire Co.
5. Triangle – PWC
6. Crescent
7. Okonite
8. Pirelli

2.2 JOINTS & SPLICES

A. Make terminations, taps and splices with an indent type pressure connector with insulating cover for No. 8 AWG and smaller.

1. Acceptable Manufacturers:

- a. Buchanan
- b. Burndy Corp.
- c. Thomas & Betts
- d. Ideal Industries

B. In lieu of indent type connectors insulated spring compression connectors may be used for No. 10 AWG and smaller.

1. Acceptable Products:

- a. Buchanan, B-Cap
- b. Ideal, Wing Nut
- c. ITT Holub, Free Spring
- d. 3M, Scotchlok
- e. Thomas & Betts

C. Use mechanical compression or bolted type connector for No. 6 AWG or larger. Cover connector with insulating tape or heat shrinkable insulation equivalent to 150% conductor insulation.

1. Acceptable Manufacturers:

- a. AMP, Inc.
- b. Burndy Corp.
- c. General Electric Co.
- d. Ideal Industries
- e. ITT Weaver
- f. 3M Co.
- g. O – Z Gedney Co.
- h. Thomas & Betts

- i. Anderson
- j. Blackburn

PART 3 – EXECUTION

3.1 BASIC WIRING

- A. Minimum wire sizes shall in no case be less than shown on the drawings and/or specified herein:
 - 1. Power and lighting branch circuits:
 - a. Where the farthest outlet of a single branch circuit is less than 75 feet from the panelboard, use No. 12 AWG wire between all outlets and for the home run of that circuit.
 - b. Where the farthest outlet of a circuit is more than 75 feet from the panelboard, use No. 10 AWG wire for the home run of that circuit and No. 12 AWG wire between all other outlets on that circuit except where larger sizes are indicated.
 - 2. 120 Volt Control and Signal Wiring: No. 14 AWG.
 - 3. Low Voltage Control Wiring: No. 16 AWG.
 - 4. Contractor is cautioned to review documents for specific sound, lighting conductor requirements, including isolated grounds, 200% neutral, enlarged grounding requirements and phase conductor increases.
 - a. Conditioned Isolated Ground Receptacles - Provide #10 minimum dedicated neutral, #8 minimum equipment ground, #2 minimum isolated ground.
 - b. Conditioned Panelboard Feeders - Provide #4/0 minimum isolated ground, and 2 gauges larger than phase, neutral conductor.
 - c. Dimming Feeders - Provide neutrals 200% of phase conditions.
 - d. Dimming Branch Circuits - Provide dedicated neutral per dimming circuit.
- B. Where conductors are adjusted in size to compensate for voltage drop, equipment grounding conductors shall be adjusted proportionately. Provide a separate equipment grounding conductor in every raceway, metallic or non-metallic. Bond at every box, pull point.
- C. Splice only in accessible junction or outlet boxes.
- D. Neatly train and lace wiring inside boxes, equipment and panelboards.
- E. Make conductor lengths for parallel circuits equal.

- F. Maintain color coding of conductors for all systems.

3.2 CONNECTIONS AND TERMINATIONS

- A. Identify each conductor in panelboards, junction or pull boxes, or troughs with a permanent pressure sensitive label with suitable numbers or letters for easy recognition. Identify control wiring at each end and in junction boxes with numeric wire number corresponding to control wiring diagram.
- B. Thoroughly clean wire before installing lugs and connectors.
- C. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- D. Terminate spare conductors with electrical tape and roll up in box.

3.3 FIELD QUALITY CONTROL

- A. Inspect wiring for physical damage and proper connection.
- B. Torque conductor terminations to manufacturer's recommended values.
- C. Perform continuity tests on all power and branch circuit conductors. Verify proper phasing. Refer to Section 260950 for specific testing requirements.

END 260120

SECTION 260130 – BOXES

PART 1 – GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor to provide:
 - a. Outlet boxes, pull and junction boxes, back boxes, and covers and fittings as specified below to complete the raceway systems.
2. Temperature Control Contractor to provide:
 - a. All boxes required for Temperature Control wiring.

1.2 RELATED REQUIREMENTS

A. Specified Elsewhere:

1. Drawings and general provisions of Contract, including, but not limited to, General, Special, and Supplementary Conditions and other Division – 1 Specification Sections, apply to the work of this Section.
2. Division 23 - applicable sections
3. Division 26 - applicable sections

1.3 SUBMITTALS

A. In accordance with Division 1.

1. Product Data: All boxes.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Outlet Boxes

1. Outlet boxes shall be galvanized or sherardized pressed steel conforming to UL Standard No. 514 and shall meet or exceed the National Electrical Code for size and material.
2. Round boxes and handy boxes shall not be used.
3. All boxes furnished shall be the type designed for the purpose served and listed for the intended application.

4. All switch and receptacle boxes shall be minimum 4 inch square for up to two devices, or solid ganged boxes for over two devices. Boxes shall be complete with minimum 3/4 inch deep tile ring for glazed tile, concrete block or concrete walls and minimum 3/4 inch deep square ring and covers, for plaster, gypsum dry wall or wood paneled finished walls; covered with 1/2 inch raised galvanized device covers for exposed conduit work.
5. Outlet boxes on exposed conduit systems shall be threaded-hub, cast-metal, conduit type fitting FS or FD suitable for wiring devices installed.
6. Outlet boxes for surface mounted ceiling fixtures shall be minimum 4 inch octagonal or square, minimum 1-1/2 inch deep with lathers channel attached to building construction for suspended ceilings; deep concrete boxes for poured concrete ceiling construction; be installed with 3/4" minimum depth plaster rings on suspended ceilings; four inch octagonal or square with fixture extension pan or deep fixture canopy to enclose the box for exposed conduit work.
7. All outlet boxes for recessed fixtures in accessible ceilings shall be minimum 4 inch square or octagonal, minimum 1-1/2 inch deep installed above fixture opening with flexible conduit connection to fixture.
8. Provide proper mud-rings. No "goof rings" will be acceptable.
9. No aluminum boxes will be accepted, unless specifically noted.
10. Acceptable Manufacturers:
 - a. Appleton
 - b. Crouse Hinds
 - c. Killark
 - d. Raco
 - e. Steel City

B. Pull and Junction Boxes

1. Pull and junction boxes shall conform to UL Standard No. 50 and be sized in accordance with the National Electrical Code or as indicated on the drawings.
2. Boxes shall be made of code gauge galvanized steel or hot dip galvanized sheet steel. Covers shall be of same gauge of box and be secured to holes with rough head silicon bronze screws spaced at 12 inch centers maximum.
3. Boxes mounted flush in walls shall have cover oversized two inches on all sides and shall be minimum 14 gauge steel.

C. Floor Boxes

1. Cast iron, rectangular, single-gang or two-gang, rain-tight, concrete tight, adjustable floor boxes as indicated, threaded conduit entrance ends, vertical adjusting rings, gaskets, brass floor plates with flush screw-on covers, ground flange and stainless steel cover screws, green enamel finish.
2. Provide duplex receptacle or communication outlet as indicated.
3. Acceptable Manufacturers
 - a. Harvey-Hubbell
 - b. Midland-Ross
 - c. Raco
 - d. Steel City

D. Cabinet Enclosures

1. Hoffman
2. ASCO

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Locate all ceiling outlets with due consideration to clearance from ventilating ducts and piping.
- B. The location of outlets shown on the drawings is diagrammatic only. Coordinate the exact location of outlets with architectural details, equipment connection requirements and work of other contractors. Architect/Engineer or Owner, Using Agency's representative may alter the location of outlets shown within a 6 foot radius prior to installation at no additional costs to project.
- C. Protect all outlet boxes from entry of foreign materials.
- D. Independently support all boxes from structure and independent of conduits. Electrical conduits shall not be used as sole supports.
- E. Suitable pull boxes shall be installed in convenient intermediate locations in all conduit runs in excess of 150 linear feet and runs requiring more than three 90 degree bends.
- F. Plug all unused openings. Use threaded plugs for cast boxes and snap in metal plugs for sheet metal boxes.
- G. Common boxes used for gang installation with switches and receptacles and low voltage devices shall include barriers between the devices and the switches or receptacles.
- H. Provide permanent barriers in common boxes to limit voltage between adjacent switches to 300 volts or less.

- I. Outlet boxes serving pendant mounted fixtures installed in structural slabs shall be installed in bottom of rib section of structural assembly unless otherwise indicated.
- J. The height of outlets and devices is indicated on the drawings or obtainable from the Architect/Engineer. Use the following as a guide for mounting of outlet boxes, unless otherwise indicated on drawings.

DEVICE	HEIGHT ABOVE FINISHED FLOOR TO TOP OF BOX (U.O.N.)
Receptacles	
Office and Corridors	18"
Above Counters	36"
Unfinished Areas	48"
Exterior at Grade	24" (above fin. grade)
Switches	48"
Data Outlets	18"
Telephone Outlets	
Wall	54"
Desk (Wall)	18"
Public	See Arch. Elevations
Fire Alarm Break Glass Stations	48"
Fire Alarm Horns/Lights	80" (per ADA)
Clock Outlets	86"

- K. Coordinate height of outlets with Drawings and equipment installations drawings and properly locate height of all outlets. Confirm all heights through Architect prior to rough-in and comply with barrier free accessibility/ADA Standards.

L. Outlet Boxes

1. Stagger outlet boxes, do not use back-to-back boxes, minimum of 12". Stuff the area between each box with fire-rated safining insulation to minimize noise and maintain wall rating.
2. For life safety, emergency spray paint inside of boxes and exposed raceways 6 inches beyond outlet with non-flammable paint.

All boxes and enclosures for essential circuits shall be marked so as to be readily identified as part of the essential system. Conduit and boxes, including back boxes, panel boards, etc., shall be spot painted. Conduit shall be identified to within 6 inches of the box or enclosure. The following color codes shall be used unless otherwise required to match existing color coding.

Red Fire Alarm System, Emergency, Life Safety

END 260130

SECTION 260133 – TERMINAL CABINETS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract - Bidding and Contract Requirements including, but not necessarily limited to, General and Supplementary Conditions and Division 1 - Specification Sections shall govern the work under this section.

1.2 WORK INCLUDED

- A. Provide all labor, materials, necessary equipment and services to complete the terminal cabinets work as indicated on the drawings, as specified herein, or both, except for items specifically indicated as "NIC ITEMS". Verify with system vendor minimum cabinet sizes and include costs in bid.

1.3 RELATED WORK

- A. Division 26 – All Applicable Sections
- B. Division 23 – All Applicable Sections

1.4 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Division 1 and Division 26.
- B. Submit schedule for each terminal cabinet indicating the system name, function and service of each wire attached to the terminal blocks. Submit size, descriptive data for each cabinet.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENT

- A. Furnish and install cabinets with terminal blocks for the splicing of cable for the various wiring systems as shown on the contract drawings. Cabinets shall be UL listed and match standard panelboards in appearance and dimension.
 - 1. Basis for Design – Square D telephone/equipment cabinets.

2.2 ACCEPTABLE MANUFACTURERS AND MATERIALS

- A. Terminal cabinets for clocks, intercom, television, fire alarm, security and all other signal systems, shall be fabricated from unpainted, galvanized, 14 gauge steel, having multiple knockouts, with lapped and riveted or welded corner construction. Cabinets shall be of sufficient size to provide a minimum space of six inches between terminal blocks and four

inches on gutter space at sides, as noted on the terminal cabinet detail, but shall not be less than system vendor's minimum recommended requirements.

- B. Trims shall be fabricated from code gauge galvanized sheet steel.
- C. Trims shall be fastened to cabinets by means of machine screws with captive nuts or clamps and shall be self-supporting on the cabinet trim after trim holding screws have been removed. Trim for flush cabinets shall overlap their respective box by at least 3/4 inch all around. Surface trims shall have the same width and height as the respective box. Doors and trims shall each be in one piece, so designed that doors will close without a rabbet.
- D. Doors shall be fabricated from the same material as the cabinet trim and shall be fastened thereto by continuous concealed hinges. Doors shall be sized so that terminal blocks do not extend into the side, top or bottom gutter space. Doors shall be complete with flush type combination lock and catch with key. Doors over 48 inches high shall be provided with vault handles, built-in locks and three point catch fastening door at top, bottom and center. Terminal cabinets wider than 24 inches shall be provided with multiple doors as required. All terminal cabinets shall be keyed alike and shall be identical to panelboard keying.
- E. Backbox interiors, inside trim, door and exterior shall be painted with a rust inhibiting phosphatized coating after pickling. Door and exterior shall be finished in ANSI-61 grey enamel. Paint inside of door in accordance with system color as described in Section 260195.
- F. Terminal cabinets shall be provided with 3/4 inch thick, fireproof plywood backboard finished with black insulating varnish with white artboard covering.
- G. Terminal blocks shall be factory assembled, channel mounted, rated for 600 volts, with a separate continuous numbering system for each wiring function and shall be Sq. D, Class 9080 or equivalent.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Each terminal cabinet shall be labeled with an engraved laminated tag securely fastened to the exterior of the door, depicting the system name.
- B. All wires shall be identified and terminated in a crimp type solderless lug and fastened under terminal screws.
- C. All wiring in terminal cabinets shall be neatly racked and bundled with non-flammable nylon ties.
- D. Terminate conduit in cabinet with locknut and insulated grounding bushings for feeders or locknut and insulated bushings for control and/or signal.
- E. Provide a stick-on type wiring diagram mounted on the inside of the door of every terminal cabinet. The wiring diagram shall exactly duplicate all wiring and devices installed in the

terminal cabinet along with wire sizes and colors, color code legend, location where each wire originates and terminates, terminal strips, etc.

- F. Provide an approved equipment ground bar in every terminal cabinet tied to local ground collection bus with a minimum #6 AWG CU THWN wire.

END 260133

SECTION 260141 – WIRING DEVICES

PART 1 – GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor to provide:
 - a. Wiring devices as specified herein and indicated on the Drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Drawings and general provisions of Contract, including, but not limited to, General, Special, and Supplementary Conditions and other Division – 1 Specification Sections, apply to the work of this Section.
2. Division 23 - applicable sections
3. Division 26 - applicable sections

1.3 SUBMITTALS

A. In accordance with Division 1.

1. Product Data: All wiring devices.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials shall conform to the following Schedule:

SCHEDULE A

DEVICE AND RATING	NEMA CONFIG	ARROW HART	BRYANT	HUBBELL	PASS & SEYMOUR
20A, 125V Duplex, Surge Suppression Receptacle 2P, 3W Grounding	5-20R			8300H-5	6362-GRY SP
Toggle Switch 1P-20A, 120/277V, A.C.	---	1991	4901	1221	20AC1
Toggle Switch 3-Way, 20A, 120/277V, A.C.	---	1993	4903	1223	20AC3
Toggle Switch, 3 Pos. M.C. Center Off - 20A, 120/277V A.C. (Low voltage switching)	---	1995	4821	1557	1251
20A, 125V, duplex, General Purpose Receptacle, 2P, 3W Grounding	5-20R	5362	5362	8300I	5362
20A, 125V Duplex Ground Fault	5-20R	GF5342	GFR53FT	9F8300I	2091-SH9

DEVICE AND RATING	NEMA CONFIG	ARROW HART	BRYANT	HUBBELL	PASS & SEYMOUR
Interrupter Receptacle					
15A, 125V, 2P, 3W Clock Receptacle Stainless Steel Plate	5-15R	5708	2828-GS	5235	S3733SS

- B. All switches and duplex receptacle shall have ivory finish.
- C. All interior switch and outlet plates shall be Type 430 stainless steel to suit outlets installed, unless otherwise specified.
 - 1. Multi-gang outlets shall be equipped with multi-gang device plates.
- D. Weatherproof outlet plates shall be stainless steel with spring loaded gasketed doors.
- E. Plugstraps for audio racks shall be Wiremold I92000 Series or approved equivalent.
- F. Isolated ground receptacles shall be Hubbel IG5362 or approved equivalent.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Refer to Section 260130 for typical mounting heights of devices.
- B. All switches and receptacles shall be flush mounted, where possible. All flush type outlets to be fitted with device plate that completely conceals opening. Use multiple gang plates where several devices are grouped. Receptacles for electric water coolers shall be concealed behind the unit.
- C. Connect wiring device grounds in accordance with NEC requirements.
- D. Locations shown are approximate. Determine exact locations at site by reference to building drawings and in conjunction with work by other trades. Coordinate location of devices in casework with Architect.
- E. Exterior outlets shall be mounted horizontally.

END 260141

SECTION 260170 – CIRCUIT & MOTOR DISCONNECTS

PART 1 – GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor to provide:
 - a. All disconnect switches for each motor and piece of electrically operated equipment shown on the Drawings or herein specified.

1.2 RELATED WORK

A. Specified elsewhere:

1. Drawings and general provisions of Contract, including, but not limited to, General, Special, and Supplementary Conditions and other Division – 1 Specification Sections, apply to the work of this Section.
2. Division 23 – applicable sections
3. Division 26 – applicable sections

1.3 SUBMITTALS

A. In accordance with Division 1.

1. Product Data: All disconnect switches.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Provide switches, fusible or non-fusible as indicated. Switches shall be heavy duty, and incorporate a quick-make, quick-break operating mechanism. Cover shall be interlocked with handle and be suitable for padlocking in "OFF" position using up to three padlocks.
- B. Switches shall be furnished in NEMA 1 general purpose enclosures unless specified as NEMA 3R on the plans. All switch enclosures installed outdoors shall be NEMA 3R (minimum) unless specified otherwise on the plans. Covers on NEMA 1 enclosures shall be attached with pin type hinges. NEMA 3R covers shall be securable in the open position. NEMA 3R enclosures for switches thru 200 amperes shall have provisions for interchangeable bolt-on hubs. NEMA 3R enclosures shall be manufactured from galvanized steel. Enclosures shall have a gray baked enamel finish, electrodeposited on cleaned, phosphatized steel.

- C. Switches shall be horsepower rated for ac and/or dc as indicated by the plans. All fusible switches rated 100 thru 600 amperes at 240 volts and 30 thru 600 amperes at 600 volts shall have a UL approved method of field conversion from standard Class H fuse spacing to Class J fuse spacing. The switch also must accept Class R fuses and have provisions for field installation of a UL listed rejection feature to reject all fuses except Class R. The UL listed short circuit rating of the switches shall be 200,000 rms symmetrical amperes when Class R or Class J fuses are used with the appropriate rejection scheme. The UL listed short circuit rating of the switch, when equipped with Class H fuses, shall be 10,000 rms symmetrical amperes. 800 and 1200 ampere switches shall have provisions for Class L fuses and shall have a UL listed short circuit range of 200,000 rms symmetrical amperes.

2.2 ACCEPTABLE MANUFACTURERS - Subject to meeting project requirements.

- A. Square D
- B. General Electric
- C. Furnas
- D. Cutler-Hammer
- E. Siemens

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Mount switches so that the disconnect handle is 5 feet - 0 inches above the finished floor when at its highest point. Provide anchoring point at each mounting hole provided in enclosure.
- B. Provide nameplate in accordance with Section 260050 to indicate equipment served or function of switch.
- C. Provide oversized switch enclosures, lugs to satisfy conductor requirements, bending radius.
- D. Provide fuse rejection clips in all switches.
- E. Provide approved equipment ground bar in all units.

END 260170

SECTION 260195 – ELECTRICAL SYSTEMS IDENTIFICATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, bidding and contract requirements, including, but not necessarily limited to, General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Division 26 – All applicable sections.
- C. Division 23 – All applicable sections.

1.2 DESCRIPTION OF WORK

- A. Extent of electrical identification work is indicated by drawings and schedules.
- B. Types of electrical identification work specified in this section include the following:
 - 1. Site Lighting Poles, Standards
 - 2. Electrical Power, Control and Communication Conductors
 - 3. Equipment/System Identification Signs
 - 4. Color Coding of System(s) Junction and Pull Boxes

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of electrical identification products of types required, whose products have been in satisfactory use in similar service for not less than three years.
- B. NEC Compliance: Comply with NEC as applicable to installation of identifying labels and markers for wiring and equipment.
- C. UL Compliance: Comply with applicable requirements of UL Standard 969, "Marking and Labeling Systems", pertaining to electrical identification systems.
- D. NEMA Compliance: Comply with applicable requirements of NEMA Standard Numbers WC-1 and WC-2 pertaining to identification of power and control conductors.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data on electrical identification materials and products.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide electrical identification products of one of the following (for each type marker):
1. Brady, W.H. Co.
 2. Cole-Flex Corp.
 3. Direct Safety Co.
 4. George-Ingraham Corp.
 5. Griffolyn Company
 6. Ideal Industries, Inc.
 7. LEM Products, Inc.
 8. Markal Company
 9. National Band and Tag Co.
 10. Panduit Corp.
 11. Seton Name Plate Co.
 12. Tesa Corp.

2.2 ELECTRICAL IDENTIFICATION MATERIALS

- A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is installer's option, but provide single selection for each application.
- B. Underground Type Plastic Line Marker: Provide manufacturer's standard permanent, bright-colored, continuous printed metallized mylar tape, intended for direct burial service; not less than 6" wide x 4 mils thick. Provide tape with printing which most accurately indicates type of service of buried cable.
- C. Cable/Conductor Identification Bands: Provide manufacturer's standard vinyl cloth self-adhesive cable/conductor markers of wrap-around type, either pre-numbered plastic coated type, or write-on type with clear plastic self-adhesive cover flap; numbered to show circuit identification.
- D. Engraved Plastic Laminate Signs: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, black face and white core plies (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
1. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units.
 2. Fasteners: Self-tapping stainless steel screws, except contact type permanent adhesive where screws cannot or should not penetrate substrate.

2.3 SITE LIGHTING POLES, STANDARDS

- A. General: Provide manufacturer's standard vinyl cloth, self-adhesive, weatherproof, fade resistant markers or permanently identified tags strapped to poles.

2.4 LETTERING AND GRAPHICS

- A. General: Coordinate names, abbreviations and other designations used in electrical identification work with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated for proper identification and operation/maintenance of electrical systems and equipment. Comply with ANSI A13.1 pertaining to minimum sizes for letters and numbers.

PART 3 – EXECUTION

3.1 APPLICATION AND INSTALLATION

A. General Installation Requirements

1. Install electrical identification products as indicated, in accordance with manufacturer's written instruction and requirements of NEC.
2. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
3. Regulations: Comply with governing regulations and request of governing authorities for identification of electrical work.

B. Underground Cable Identification

1. General: During backfilling/top-soiling of each exterior underground electrical signal or communication cable, install continuous underground type plastic line marker, located directly over buried line at 6" to 8" below finished grade. Where multiple small lines are buried in a common trench, and do not exceed an overall width of 16", install a single line marker.
2. Install line marker for every buried cable regardless of whether direct buried or protected in conduit.

C. Cable/Conductor Identification

1. General: Apply cable/conductor circuit identification on each cable/conductor in each box/enclosure/cabinet where wires are terminated.

D. Equipment/System Identification

1. General: Install engraved plastic laminate sign on each major unit of electrical equipment in building; including central or master unit of each electrical system, including communication/control/signal system, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single

line of text, 1/2" high lettering, on 1-1/2" high sign (2" high where 2 lines are required, white lettering in black field). Provide text matching terminology and numbering of the Contract Documents and shop drawings. Provide signs for each unit of the following categories of electrical work (including, but not limited to):

- a. Panelboards, electrical cabinets, enclosures, terminal cabinets
 - b. Access panel/doors to electrical facilities
 - c. Major electrical switchgear
 - d. Electrical substations
 - e. Motor control center
 - f. Power transfer equipment
 - g. Transformers
 - h. Power generating units
 - i. Telephone switching equipment
 - j. Clock/program master equipment
 - k. Call system master station
 - l. TV/audio monitoring master station
 - m. Fire alarm master station
 - n. Security monitoring master station
 - o. Terminal cabinets for all systems
 - p. Disconnect switches
 - q. Motor starters, contactors
 - r. Remote test stations for duct detectors
2. Install signs at locations indicated or, where not otherwise indicated, at location for most convenient viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate.

E. Junction Box/Pull Box Color Coding

1. General: Inside and outside of electrical systems junction boxes to be painted as noted below to provide easy identification of systems:
 - a. Emergency Power Red
 - b. Fire Alarm System Red
 - c. Security Yellow
 - d. DATA Blue
 - e. Telephone Green

F. Pole Identification

1. Submit shop drawings with Contractor selected pole identification numbering system for review and record. These identification numbers shall become part of the as-built records.

END 260195

SECTION 260450 – SECONDARY GROUNDING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Includes:

1. Power system grounding for Services.
2. Grounding for Separately Derived Systems
3. Grounding for Control Circuitry.
4. Grounding for equipment.

1.2 RELATED WORK

A. Specified Elsewhere:

1. Drawings and general provisions of Contract, including, but not limited to, General, Special, and Supplementary Conditions and other Division – 1 Specification Sections, apply to the work of this Section.
2. Division 23 – Applicable sections
3. Division 26 – Applicable sections

1.3 SYSTEM DESCRIPTION

- A. Grounding electrical service neutral at service entrance equipment to metal underground water pipe, metal frame of building and grounding rod.
- B. Ground each separately derived system neutral to structural member of building.
- C. Ground raceways and electrical equipment; use double locknuts at all panels; use bonding jumpers where conduits are installed in concentric knockouts. Ground panels, switches, motor frames, motor starters, and outlets with separate ground conductor in conduit system.
- D. Bond together system neutrals, service entrance enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground terminals, building structural steel and plumbing systems.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with NFPA 70, National Electric Code.
2. UL 467: Grounding and Bonding Equipment.

1.5 SUBMITTALS

- A. In accordance with Division 1.
- B. Test data in accordance with Section 260950.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Materials used for grounding conductors shall be in accordance with N.E.C. Article 250-91.
- B. Ground Rods: Copper-Clad, 3/4 inch O.D. x 10'-0", min. or as noted.
- C. Connections: Exothermic weld type.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Connect grounding electrode conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of meter. Provide bonding jumper around water meter.
- B. Supplemental grounding electrode: Use driven ground rod where shown on drawings. Provide mechanical protection, Brooks boxes where shown on documents for accessibility to all ground rods.
- C. Bond all grounding systems together.
- D. Isolated grounding system: Use insulated equipment grounding conductor and connect to service grounding electrode.
- E. Separately Derived Systems: Provide connection to building steel bonded to neutral of transformer.
- F. Where motors are connected to conduit system with flexible conduit section, install grounding conductor in flexible section.
- G. Provide ground rod at each exterior pole light fixture and connect to base of pole. Provide surge suppression unit at each exterior pole light fixture.

3.2 FIELD QUALITY CONTROL

- A. Measure ground resistance in accordance with Section 260950.

END 260450

SECTION 260471 – CIRCUIT BREAKER PANELBOARDS

PART 1 – GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor is to provide:
 - a. Panelboards herein specified and shown on the drawings.

1.2 RELATED WORK

A. Specified Elsewhere:

1. Drawings and general provisions of Contract, including, but not limited to, General, Special and Supplementary Conditions and other Division – 1 Specification Sections, apply to the work of this Section.
2. Division 23 - applicable sections
3. Division 26 - applicable sections

1.3 SUBMITTALS

A. In accordance with Division 1.

1. Shop Drawings: Panelboards
2. Product Data: Circuit breakers.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Panelboards rated 208Y/120 volt shall have copper bus structure braced for minimum, but not limited to, 10,000 RMS amps fault current and panelboards rated 480Y/277 volts shall have copper bus structure braced for minimum, but not limited to, 14,000 RMS amperes fault current, or as indicated on the drawings, whichever is greater. All copper parts shall be plated to prevent corrosion. Provide panelboards that are "fully rated" for the available short circuit amperes at the point of application.
1. All panelboards shall be Dead-Front Safety Type, equipped with thermal-magnetic molded case breakers, and solid neutral bus.
 2. Bus bar connections to the branch circuit breakers shall be the "Distributed Phase" or "Phase Sequence" type. Bussing shall be such that adjacent single pole breakers will be

on different phases or polarities, and that two or three pole breakers can be installed at any location.

3. Panelboard numbering shall be such that starting at the top, odd numbers shall be used in sequence down the left hand side and even numbers shall be used in sequence down the right hand side.
- B. Cabinets shall be fabricated of code gauge galvanized steel with gutters per National Electrical Code. Fronts shall have doors with matching one piece trim, be code gauge and be finished with rust inhibiting primer and baked enamel. Fronts shall have adjustable indicating trim clamps completely concealed when door is closed. Provide a circuit directory frame and card with a clear plastic covering on the inside of the doors. Fronts shall have flush locks, and be furnished with two keys per lock.
- C. Provide circuit breakers, quick-make, quick-break, thermal-magnetic, trip indicating, and common trip on all multipole breakers. Branch circuit breakers feeding convenience outlets shall have sensitive instantaneous trip settings of not more than 10 times the trip rating of the breaker. Circuit breakers shall have bolt-on connections to the bus. Ratings are shown on the panelboard schedule.
- D. Main circuit breaker: Circuit breaker ampere rating as shown on drawings, 3-pole, single-throw, front connected. Molded case, thermal-magnetic, common trip, quick-make, quick-break, adjustable magnetic trip elements, minimum ampere RMS interrupting rating, as specified. Provide where indicated on drawings.
- E. Breakers intended to switch fluorescent lighting loads on a regular basis shall be rated for switching duty.
- F. Provide ground fault circuit interrupter circuit breakers rated to trip at 30 milliamperes for circuits as shown on drawings.
- G. Panelboards shall be furnished with ground bus and separate insulated neutral bus and a separate isolated ground bus.
- H. Provide 200% rated neutral bus where shown on documents.
- I. 208Y/120 Volt Panelboards:
 1. Acceptable Products: Subject to meeting project requirements
 - a. G.E. Type AG
 - b. Square D Type NQOD
 - c. Cutler-Hammer PB
 - d. Siemens CDP-7
- J. 480Y/277 Volt Panelboards:
 1. Acceptable Products:

- a. General Electric AE
 - b. Square D Type NEHB
 - c. Cutler Hammer PH
 - d. Siemens CDP-7
- K. Provide high magnetic trip (high inrush) style breakers for panels CP1, CP2 (fed from line conditioner). Basis for design is Square-D Series QO-HM 20 or approved acceptable products vendor equivalent style.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Locate as shown on drawings. Maximum distance from floor to highest breaker: 6 feet - 6 inches.
- B. Provide mounting materials required; make connections specified or shown. Use collars around mounting bolts, or equivalent means to provide 1/4" minimum air space between panel and wall for surface mounted panel.
- C. Provide nameplate for each panel in accordance with 260050.
- D. Provide typed circuit directory for each panel indicating load served. Leave spare circuit breakers and circuit breaker space blank on directory. Load served description shall indicate type, room or area designation, wattage ex: circuit 1 - Rooms 100, 101, 102, lighting, 1600W.
- E. Where double-panels are indicated, provide single common trim or allow for two individual covers when mounting cabinets.

END 260471

SECTION 260475 – OVERCURRENT PROTECTIVE DEVICES

PART 1 – GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor to provide:
 - a. Fuses for all fusible equipment installed on the project regardless of which contractor has provided the equipment.
 - b. Enclosed circuit breakers as indicated on the drawings and herein specified.

1.2 RELATED WORK

A. Specified Elsewhere:

1. Drawings and general provisions of Contract, including, but not limited to, General, Special, and Supplementary Conditions and other Division – 1 Specification Sections, apply to the work of this Section.
2. Division 23 – Applicable sections
3. Division 26 – Applicable sections

1.3 SUBMITTALS

A. In accordance with Division 1.

1. Shop Drawings: Enclosed circuit breakers
2. Product Data
 - a. Fuses
 - b. Enclosed circuit breakers
 - c. Provide OCPD characteristic curves.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Fuses rated 601 amperes to 6000 amperes, 600 volt and below, shall be UL listed Class L current limiting type, 200,000 amperes, RMS interrupting.
1. Acceptable Products (subject to meeting project requirements)
 - a. Bussman Limitron - Type KLU
 - b. Little Fuse - Type KLLU
 - c. Gould Shawmut- Type A4B

- B. Fuses rated 15 to 600 ampere (except for motor branch circuit protection), 600 volt and below, UL listed Class RK-1 current limiting type, 200,000 amperes RMS interrupting.
 - 1. Acceptable Products
 - a. Bussman Limitron - Type KTS-R
 - b. Little Fuse - Type KLSR
 - c. Gould Shawmut - Type A2K (250 VAC)/A6K (600 VAC)
- C. Fuses for motor branch circuit and transformer protection U.L. listed Class RK-5 dual element type, 200,000 amperes RMS interrupting.
 - 1. Acceptable Products
 - a. Bussman Fusetron - Type FRS-R
 - b. Little Fuse - Slo-Blo, Type FLS-R
 - c. Gould Shawmut - Type TR (250 VAC)/TRS (600 VAC)
- D. Furnish and install individually enclosed circuit breakers as indicated on the plans. All circuit breakers shall meet Federal Specification W-C-375B, and both the circuit breaker and the enclosure shall be UL listed.
- E. Circuit breakers shall have overcenter toggle type mechanisms, providing quick-make, quick-break action. Breakers shall have current and interrupting rating as indicated on the plans. Each circuit breaker shall have trip indication by handle position and shall be trip-free. Two and three pole breakers shall be common trip. Each breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole.
- F. Neutrals shall be furnished in devices as indicated on the plans. Neutrals shall be insulated and are to be groundable for use in service entrance applications.
- G. Enclosures shall be of the NEMA type indicated on the plans.
- H. NEMA 1 enclosures shall be furnished with knockouts where practical and shall be fabricated from sheet steel which conforms to UL 50. The enclosure shall be given an electrodeposited, gray baked enamel finish. Padlocking provisions shall be provided to allow locking the circuit breaker in the "OFF" position. Enclosures shall be UL listed.
- I. NEMA 3R enclosures for circuit breakers rated through the 225 ampere frame size shall be furnished with provisions for interchangeable, bolt-on hubs. Enclosures shall be fabricated from galvanized steel and shall be given an electrodeposited, gray baked enamel finish. Enclosure covers shall be securable in the open position. Padlocking provisions shall be provided to allow locking the enclosure cover closed. Enclosures shall be UL listed.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Fused distribution system is designed to provide selectivity, coordination, and component protection. To guarantee this system, all fuses shall be from the same manufacturer. Substitution provisions are specified in Division 1.
- B. Place a fuse identification label showing size and type of fuses installed inside the cover of each switch.
- C. Furnish Owner at completion of project, one spare set (3) of each size of fuse rated over 600 amperes, and 10 percent spare fuses of each size and type rated 600 amperes or less, but not less than three. Obtain a written receipt for same from the Owner.
- D. Provide a nameplate for each enclosed circuit breaker in accordance with Section 260050.

END 260475

SECTION 260950 – TESTING

PART 1 – GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor to provide:
 - a. Testing of electrical components and equipment as herein specified.

1.2 RELATED WORK

A. Specified Elsewhere

1. Drawings and general provisions of Contract, including, but not limited to, General, Special, and Supplementary Conditions and other Division – 1 Specification Sections, apply to the work of this Section.
2. Division 23 – Applicable sections
3. Division 26 – Applicable sections

1.3 SYSTEM DESCRIPTION

A. Testing includes:

1. Resistance tests.
2. Continuity tests.
3. Phase relationship verification.
4. Voltage tests.
5. Medium voltage cable hi-pot.
6. Ground fault protection tests.
7. Operation of the Manual Transfer Switch.

1.4 QUALITY ASSURANCE

A. Regulatory Requirement

1. Comply with the National Electrical Code, NFPA 70.
2. NFPA 101.

- B. Testing authority shall be certified and qualified in electrical testing procedures. Provide experience and resume with bid proposal.

1.5 SUBMITTALS

- A. Test Reports: All test reports shall be submitted in triplicate, assembled and bound, to Architect/Engineer prior to final acceptance.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Furnish all test equipment to perform specified testing.
- B. Contractor shall certify and maintain accuracy of all test equipment used on this project for testing.

PART 3 – EXECUTION

3.1 TESTS

- A. Conduct such tests and adjustment of equipment as necessary to verify performance requirements.
- B. Test Reports: Typewritten, listing testing equipment used, person or persons performing the tests, date tested, circuits tested, motor or equipment nameplate data, and results of tests.
- C. Insulation resistance tests general:
 - 1. Perform insulation resistance tests on equipment and cables listed herein.
 - 2. Test equipment: Furnished by Contractor.
 - 3. Resistance measured; line-to-ground.
 - 4. Disconnect, prior to testing, any device that could be damaged by application of voltage.
- D. Insulation resistance tests shall be conducted per following schedule:

Item Tested	Voltage of Test	Min. Acceptance Resistance in Megohms
No. 2 and larger cables (600 V)	1000V	50
Motors	500V	5
Switchboards, Motor Control Centers and Panelboard Buses	1000V	25
Step-down Transformers	500V	5

- E. Ground Resistance
 - 1. Measure and record ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment.

Minimum acceptable resistance: 10 ohms. When resistance exceeds 10 ohms, drive and bond another ground rod, one ground rod length away and repeat test.

F. Continuity Test

1. Test branch circuits and control circuits to determine continuity of wiring and connection. Submit written statement that this has been performed.
2. Test security power, control and communications circuit to determine continuity of wiring.

G. Voltage test shall be made and recorded at the following listed points. Tests shall be conducted under normal load conditions.

1. Service entrance at main disconnect switch.
2. Secondary terminals of all step down transformers.
3. Terminals of all motors.

H. Phase Relationship: Check connections to equipment for proper A-B-C phase relationships. Verify proper motor relation.

1. Disconnect, prior to check, any device that could be damaged by the application of voltage of reversed phase sequence.

I. Phase Balancing: Contractor shall balance phase loadings to substantially allow equivalent currents across all phases. Check all panels, switchboards, and adjust for balancing by circuit rearrangement. Issue report and as-built.

J. Test isolated ground system to certify isolation integrity.

3.2 CORRECTIONS OF DEFECTS

- A. If tests disclose any unsatisfactory workmanship or equipment furnished under this contract, Contractor shall repair or replace such defects immediately without additional cost.
- B. If any wiring or equipment is damaged by tests, Contractor shall repair or replace such wiring or equipment immediately without additional cost.
- C. Upon correction of defects, Contractor shall re-test until proper results are obtained.

END 260950