ORANGE COUNTY PUBLIC WORKS
BUILDINGS 1, 2 & 7
SMOKE DAMPERS REPLACEMENT
100 % CONSTRUCTION DOCUMENTS

FOR
ORANGE COUNTY
FACILITIES MANAGEMENT DIVISION
2012 EAST MICHIGAN ST.
ORLANDO, FLORIDA 32806

BY
MATERN PROFESSIONAL ENGINEERING, INC.
130 CANDACE DRIVE
MAITLAND, FLORIDA 32751

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Division 1

01010	Summary of Work
01027	Application for Payment
01035	Modification Procedures
01300	Submittals
01631	Products Substitutions
01700	Project Close-out
01740	Warranties and Bonds

Division 2

02070	Demolition and Alterations

Division 7

07841	Through-Penetration Firestop Systems

Division 9

09510	Acoustical Ceilings

Division 15 Mechanical

15010	Mechanical General Provisions
15020	HVAC Demolition
15050	Basic Materials and Methods
15090	Supports, Hangers, Anchors and Sleeves
15250	Insulation
15840	Shop Fabricated Ductwork
15846	Pre-Fabricated Ductwork
15860	Sheet Metal Specialties
15870	Grilles, Registers and Diffusers

Division 16 Electrical

16010	Basic Electrical Requirements
16012	Submittals
16014	Reference Standards and Regulatory Requirements
16015	Electrical Symbols and Abbreviations
16060	Minor Electrical Demolition for Remodeling
16061	Investigation of Existing Electrical Systems
16095	Demonstration of Completed Electrical Systems
16098	Operation and Maintenance Manuals
16111	Conduit
16112	Surface Raceways
16131	Outlet Boxes
16133	Pull and Junction Boxes
16190	Hangers and Supports
16195	Identification for Electrical Systems
16721	Addressable Fire Alarm/Detection System (Extension of Existing)

SECTION 01010
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.

B. When the titles such as Engineer, Project Engineer, or Owner are used throughout this specification, this implies Orange County as property owner and/or an officially appointed County Representative.

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. The work consists of the following:

- Remove the existing air compressor in Building 1 and Building 7.
- Remove every pneumatic combination fire/smoke damper in Building 1, 2, and 7.
- In Building 1, 2, and 7, provide new combination fire/smoke dampers of equal size with an electronic 24V actuator as shown on the plans.
- Remove every duct access door in conjunction with the combination fire/smoke dampers and replace with new standard size duct access door in new section of duct.
- Remove existing pneumatic air tubing lines, pneumatic switches, and pneumatic control cabinets in all mechanical rooms in Building 1 and 2.
- Add Addressable Fire Alarm Relays to fire/smoke dampers in Buildings 1, 2, and 7.
- Add Addressable Fire Alarm Shut Down Relays to Air Handling Units in Buildings 1, 2, and 7.
- Remove Obsolete Conventional Fire Alarm Panels in Buildings 2 and 7 and replace with a Silent Knight Addressable Fire Alarm Panel.

1. The contractor shall have all submittals approved by the Engineer and accepted by the Owner prior to the start of active construction.

2. The contractor shall have all equipment and material onsite prior to the start of active construction.

3. The contractor shall submit to the Owner prior to the project pre-construction meeting the following:

   - Schedule of Values
   - Construction Schedule
   - Submittal Schedule
   - Emergency Telephone List including subcontractors and suppliers

4. The contractor shall field verify existing conditions of construction prior to

start of active construction.

5. The contractor shall coordinate with the Owner on the operation of the existing fire alarm system prior to the start of active construction. There shall be an action plan for the operation of the fire alarm system during construction submitted by the contractor to the Owner for acceptance. This action plan shall be in place prior to the start of active construction. Any false fire alarms that occur during construction and deemed by the Owner to be the fault of the contractor, the contractor shall pay all costs incurred from the local fire department for responding to a false alarm.

6. The contractor is responsible for moving furniture and or equipment if necessary to perform the work included in the contract. The contractor is responsible for placing the furniture and or equipment back in its original location. The contractor is responsible for any damages to furniture, equipment, etc., which occur during construction. The contractor shall provide protection for floors, walls, furniture, equipment and any other items that may be subject to damage during the construction periods.

7. The contractor shall coordinate with the Owner on the operation of the security alarm system prior to the start of active construction. The contractor shall submit an action plan for operation of the security alarm system during construction to the Owner for acceptance prior to start of active construction. This active plan shall be in place prior to the start of active construction. Any false security alarms that occur during construction and deemed by the Owner to be the fault of the contractor, the contractor shall pay all cost incurred from the local police and or sheriff department for responding to a false alarm.

8. The contractor shall videotape or take pictures of pre-existing conditions of the interior and exterior of the building prior to the start of active construction. Failure to provide photographs or videotape prior to start of construction, places the responsibility on the Contractor to complete the necessary replacement, repairs, and or cleaning as determined by the Owner at no additional cost to the Owner. One set of photographs (in a three-ring binder) or videotape of the site existing conditions shall be submitted to the Owner.

9. The contractor shall at all times maintain daily cleanup of construction areas. Work areas that are not cleaned by the contractor, and cleaned by the Owner, those costs shall be charged back to the contractor via change order.

10. The contractor shall provide a construction schedule to the Owner's Project Manager prior to the pre-construction meeting.
The contractor shall update the construction schedule weekly and submit it to the Owner's Project Manager for review.

1.04 WORK UNDER OTHER CONTRACTS

A. Separate contracts may be issued to perform certain construction operations at the site.

1.05 WORK SEQUENCE

A. The facility shall remain fully occupied and operational while work is in progress. All outdoor work shall be performed during normal business hours. Normal business hours

are defined as 8am to 5pm. Material and equipment deliveries will be during normal business hours. Indoor work may be performed during normal working hours; work in other phases shall be performed after hours, unless authorized by Owner for daytime work. After hours is defined as 6pm to 6am Monday through Friday.

B. The contractor may work on the weekends at his or her discretion. Weekend work shall not be an additional cost to the Owner. The contractor will coordinate with the Owner for access to the building on weekends and after hours work.

1.06 CONTRACTOR USE OF PREMISES

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

B. General: Limited use of the premises to construction activities in areas indicated within the limit of the premises. The Contractor may use any portion of the site for storage or work areas or any legal purpose.

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. Where appropriate, maintain the existing building in a watertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and it's occupants during the construction period.

5. Confine construction operations to the areas permitted by the contract documents and other Owner directives.

6. Provide protection and safekeeping of material and equipment stored on premises.

7. Contractor will move any stored material and equipment, which interfere with operations of the Owner or other contractors.

8. Comply with Owners' requirements for ingress and egress procedures, prohibitions against firearms, procedures for transportation of workers, safety and fire prevention requirements and pollution control requirements.

9. Contractor to require all employees and subcontractors to wear non-objectionable clothing; prohibit revealing clothing and articles of clothing with offensive writings displayed. The contractor shall require offending personnel to leave the premises until such clothing is changed.

10. Contractor employees and subcontractors will not fraternize with County employees or the general public during the entire construction period.

11. Use of sound equipment (such as boom boxes, stereos, radios, etc.) during day times of construction is not allowed.

12. Smoking is not allowed inside the building.

13. Conduct that is disrespectful, abusive or otherwise objectionable to the Owners' employees or general public will not be allowed at any time during the construction period. Repetitive complaints and violations of the requirements listed above will be cause for dismissal and or permanent removal of offending personnel from the project.

14. Contractor to coordinate with the Owner the site location for storage of equipment, machinery, materials, tools and a construction waste dumpster.

15. Contractor shall at all times keep the premises free of all waste or surplus materials, rubbish and debris, which is caused by contractor employees or subcontractors resulting from their work. Contractor shall maintain a safe work environment to all building occupants during the construction period.

1.07 OWNER OCCUPANCY

A. Owner Occupancy: The Owner will be occupying the building during construction. Normal occupancy hours are 7 AM to 6 PM Monday through Friday. The contractor is to coordinate with the Owner's representative for areas in the building that work can be performed on during normal business hours. Work performed after normal business hours can be done provided the area where work is done is fully operational and back in original condition prior to beginning of 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 local building officials prior to Owner occupancy.

3. Prior to partial Owner 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.

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.

PART 2 - PRODUCTS

2.10 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 in Section 01400, QUALITY CONTROL. 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 01010

SECTION 01027
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 01300 – "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.

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 subcontract amounts down into several line items:

a. A value will be given for at least every major specification section (subsections can logically be grouped together).
b. A single material subcontractor 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. 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. HVAC: Typically shown per specification section, labor and material, per floor.
g. Electrical: same as HVAC.
h. Logical grouping of specification subsections are 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 Contractor's 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's 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. See items G, I, J and K of this section.

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 Contractor s 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 six (6) 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. Waivers of Mechanics Lien: With each Application for Payment submit waivers of mechanics liens from subcontractors of sub-subcontractors and suppliers for the construction period covered by the previous application.

1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. The Owner reserves the right to designate which entities involved in the work must submit waivers.
4. List all Subcontractor’s start and finish dates to substantiate any Notice to Owner received by the Project Manager.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:

1. List of principal subcontractors
2. List of principal suppliers and fabricators
3. Schedule of Values
4. Approved Contractor’s Construction Schedule (preliminary if not final)
5. Schedule of principal products
6. Schedule of unit prices (if applicable)
7. Submittal schedule (preliminary if not final)
8. List of Contractor’s staff assignments
9. List of Contractor’s principal consultants
10. Copies of building permits for trades requiring separate permits
11. Copies of authorizations and licenses from governing authorities for performance of the Work
12. Initial progress report
13. Report of Pre-construction Meeting
14. Initial settlement survey and damage report, (if required)
15. Listing of all long lead procurement items monthly applications for payment will be accompanied with updated schedule and review of as-built drawings

H. Interim Application for Payment: Payment will be processed once a month. No applications will be processed without receipt of previous months waiver of lien described in subsection F above. 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 interim applications.

I. 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.

J. Administrative actions and submittals that shall proceed or coincide with Substantial Completion Payment. Substantial Completion as defined per General Conditions Section "F" application include:

1. Occupancy permits and similar approvals
2. Warranties (guarantees) and maintenance agreements
3. Test/adjust/balance records
4. Maintenance instructions
5. Start-up performance reports
6. Change-over information related to Owner's occupancy, use, operation and maintenance
7. Final cleaning
8. Application for reduction of retainage, and consent of surety
9. List of incomplete Work, recognized as exceptions to Project Manager's Certificate of Substantial Completion

K. 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
3. Assurance that unsettled claims will be settled
4. Assurance that all work has been completed and accepted
5. Proof that taxes, fees and similar obligations have been paid
6. Removal of temporary facilities and services
7. Removal of surplus materials, rubbish and similar elements
8. Change of door locks to Owner's access

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 01027

SECTION 01035
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.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 1 Section 01300 Submittals for requirements for the Contractor's Construction Schedule.
2. Division 1 Section 01027 Application for Payment for administrative procedures governing applications for payment.
3. Division 1 Section 01631 Product Substitutions for administrative procedures for handling requests for substitutions made after award of the Contract.

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 Representatives findings require

modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Engineer.

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 01631 “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.

C. Proposal Request Form: Project Manager will transfer the information to the appropriate forms for approval. Use AIA Document G 709 for Change Order Proposal Requests.

D. Proposal Request Form: Use forms provided by the Owner for Change Order Proposals.

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.

1.06 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)
PART 3 EXECUTION (Not Applicable)

END OF SECTION 01035

SECTION 01300
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 01027 "Applications for Payment".

1.03 SUBMITTAL PROCEDURES

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

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.

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

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

2. Include the following information on the label for processing and recording action taken.
a. Project name
b. Date
c. Name and address of Engineer
d. Name and address of Contractor
e. Name and address of subcontractor
f. Name and address of supplier
g. Name of manufacturer
h. Number and title of appropriate Specification Section
I. Drawing number and detail references, as appropriate.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Project Manager using transmittal form as provided by the Project Manager. Submittals received from sources other than the Contractor will be returned without action.

1. On the transmittal record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitation. Include Contractor’s certification that information complies with Contract Document requirements.

2. Transmittal Form: As provided by the Project Manager

D. Contractor shall be responsible for cost of re-review of rejected submittals, shop drawing, etc. 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 consultants 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 excepting the substitute.

1.04 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Critical Path Method (CPM) Schedule: Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule.

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the work as indicated in the Schedule of Values.

2. Within each time bar, indicate estimated completion percentage in 10 percent increments. As work progresses, place a contrasting mark in each bar to indicate Actual Completion.

3. Prepare the schedule on a sheet, series of sheets, stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.

4. Secure time commitments for performing critical elements of the work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the work.

5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment request and other schedules.

6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Engineer's procedures necessary for certification of Substantial Completion.

B. Phasing: Provide notations on the schedule to show how the sequence of the work is affected by requirements for phased completion to permit work by separate Contractors and partial occupancy by the Owner prior to Substantial Completion.

C. Work Stages: Indicate important stages of construction for each major portion of the work, including testing and installation.

D. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the work. Indicate where each element in an area must be sequenced or integrated with other activities.

E. Cost Correlation: At the head of the schedule, provide a two item cost correlation line, indicating precalculated and actual costs. On the line show dollar-volume of work performed as the dates used for preparation of payment requests.

1. Refer to Section Applications for Payment for cost reporting and payment procedures.

F. Distribution: Following response to the initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the project meeting room and temporary 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.

G. Schedule Updating: Revise the schedule monthly or activity, where revisions have been recognized or made. Issue the updated schedule concurrently monthly pay request.

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 for 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 revisions 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" x 11" but no larger than 24" x 36".
7. Initial Submittal: Submit one correctable translucent reproducible print and one blue-or black-line print for the Project Manager’s review; the reproducible print will be returned.
8. Initial Submittal: Submit 2 blue-or black-line prints for the Engineer's review; one will be returned.
9. Final Submittal: Submit 5 blue-or black-line prints; submit 7 prints where required for maintenance manuals. 3 prints will be retained; the remainder will be returned.
10. Final Submittal: Submit 3 blue-or black-line prints; submit 5 prints where required for maintenance manuals. 2 prints will be retained; the remainder will be returned.
    a. One of the prints returned shall be marked-up and maintained as a Record Documents.
11. 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. Submit coordination Drawings for integration of different construction elements. Show sequence and relationships of separate components to avoid any conflict including conflicts in use of space.

3. 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 “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/Project Manager 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: Where submittals are marked No Exceptions Taken, that part of the work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

2. Final-But-Restricted Release: When submittals are marked Made Corrections Noted that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.

3. Returned for Resubmittal: When submittal is marked Revise and Resubmit, do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

    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.

PART 2 PRODUCTS (Not Applicable)

PART 3 Execution (Not Applicable)

END OF SECTION 01300

SECTION 01631
PRODUCTS 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 made during bidding and after award of the Contract.

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

C. Standards: Refer to Section "Definitions and Standards" 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: The Contract will be awarded based on the design, methods, materials and/or equipment as addressed in the Contract Drawings and/or described in the Contract Specifications, without any consideration for substitution or "or-equal" replacement. Addressing, describing or naming an item is intended to establish the type, function, characteristics and quality required in order to establish a base for bidding.

1. Within thirty (30) days after Contract award, the Contractor may submit for approval substitutes for any equipment and/or material. In addition to the product documents, a written certification shall accompany the documentation indicating that the proposed substitute will have the same characteristics, will perform in accordance with the design requirements and that complies with all the requirements set for in the Contract. Any additional information required by the Owner or County Representative shall be provided by the Contractor. Rejection of any proposed substitute will be considered final and the Contractor shall not get into any agreement with manufacturers or providers until the submittal has been finally approved.

2. The submission of this documentation shall follow the requirements set quality required in order to establish a base for bidding.

1.04 SUBMITTALS

A. Substitution Request Submittal: Request for substitution will be considered if received within thirty (30) days after contract award. 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 Contractors 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. Engineer's 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, which ever 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.

END OF SECTION 01631

SECTION 01700
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.

1.01 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 15 through 16.

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 in 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 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 purposed; 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. Organize record drawing sheets, and print. suitable titles, dates and other identification on the cover of each set.

5. Provide three (3) additional sets of black line drawing sets of As-Builts Drawings.

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 Owner's 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 Owner's 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 Owner's 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)

PART 3 EXECUTION

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 competed 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 ½" 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.

3.02 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 01700

SECTION 01740
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 manufacturers 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 "Project Close-Out".

3. Specific requirements for warranties for the work and products and installations that are specified to be warranted, are included in this document.

4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

B. Disclaimers and Limitations: Manufacturer's 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.
. 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. Owner's 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 Engineer's 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 Substantial Completion except for items which are determined by the County to be incomplete or a non-comply status at the time of Substantial 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 manufacturer's 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 of Division 2 through 16 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 1/2“ 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 01740

SECTION 02070
DEMOLITION AND ALTERATIONS

PART 1 - GENERAL

1.1 SCOPE OF SECTION

A. Cut, demolish and remove existing work associated with the renovation. Cut and remove existing work as indicated or necessary to fit new work to existing that is to remain. Where practical, salvage existing items that may be reused or are indicated for reuse or to be turned over to Owner.

1.2 REFERENCE STANDARDS

A. The latest edition of publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

1. ASTM E 84 Surface Burning Characteristics of Building Materials

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

2. NFPA 241 Safeguarding Construction, Alteration and Demolition Operations

B. Unknown Conditions: Work shall not include Contractor's identification, detection, abatement, encapsulation or removal of asbestos or similar hazardous substance(s). In the course of performing this work, if such material/product is encountered, discontinue work and remove workers from the project until such material/product and hazards connected therewith are abated, encapsulated or removed, or it is determined that no hazard exists. An extension of time will be granted for delay resulting form such condition and correction.

C. Structural Members: Do not cut any building structure without written authorization of the Engineer. Any structural members intentionally cut without proper authorization or accidentally cut shall be restored to their original integrity and condition.

1. Do not cut or drill existing concrete pre cast slabs. Use existing chases and openings at floor slabs.

1.3 PROTECTION

A. Safety: Before commencing any work, provide warning signs, lights, barricades, fences, rails and other safety devices. Exercise caution when working adjacent to spaces occupied by Owner's personnel.

B. Temporary Work: Do not commence demolition until temporary shoring, bracing, partitions, exits and other support and protective measures have been properly installed.

C. Temporary Partitions and Closures: Where new existing openings are created and where work is in occupied spaces or existing equipment, provide physical separation and protect from dust and moisture with partitions and closures. Maintain partitions in place until new work has been completed and provide protection from the weather and dust. Before and during removal, clean all surfaces with a vacuum cleaner (to avoid dispersion

of dust).

D. Portable Coverings: For minor interior alterations, where acceptable to Engineer, flame-proofed drop cloths may be used. Plastic sheet or film shall not be used for any purpose for interior work.

E. Air filters: During Demolition provide portable air filters as part of dust control.

F. Wet mop concrete floors slab to control dust.

G. Vacuum space every day at the completion of the work.

1.4 SECURITY

A. Establish procedures and execute operations to provide continuous security. Provide temporary protection for openings and at other locations as may be appropriate during construction. Deny entrance of unauthorized persons into work area.

1.5 HOUSEKEEPING

A. Collect debris, rubbish and trash resulting from operations at designated places. Sprinkle dusty debris with water. Handle in a controlled manner. Do not accumulate waste unnecessarily; remove promptly from premises; generally daily. Sweep and vacuum floors in work areas as frequently as necessary to maintain premises in acceptable condition for continuous, uninterrupted operation by Owner.

1.6 OCCUPIED SPACES

A. Since the building will maintain operations, coordination will be required with building staff and owners representative to coordinate time of demolition to minimize disturbance occupants.

PART 2 - MATERIALS

2.1 LUMBER

A. Wood and plywood used in building temporary partitions shall be fire-retardant treated to provide flame spread rating, per ASTM E 84, or maximum of twenty-five (25).

2.2 TAPE

A. Kraft paper two (2) inches wide with pressure sensitive adhesive one side. Shear strength (peel adhesion); 60-oz. per inch width. Acceptable: FasTape.

2.3 TEMPORARY CLOSURES

A. In addition to the requirements of Division 0, flame-proofed drop cloths (not flammable plastic), UL labeled, flame spread maximum fifteen (15). Where daylight would be beneficial for workmanship and reduce need of artificial illumination, translucent polyvinyl chloride film reinforced in diamond pattern with 33 nylon threads per foot. Acceptable: "Griffolyn" T-55-FR, Reed Industries, Box 248, Houston, Texas 77233, phone 800/231-6074.

PART 3 - EXECUTION

3.1 RELOCATION AND REMOVAL

A. Temporarily remove or suitably relocate designated equipment, utilities or services to clear the work, or to properly function in the complete installation. Where services or utilities are removed, suitable cap or terminate according to applicable ordinances and requirements of governing authorities and/or per other sections of specifications and drawings. Where such items interfere with the work and specific instructions are not included on the drawings, they shall be adequately protected and further instructions requested from the Engineer. Existing construction that does not interfere with new work and will be concealed may remain in place unless indicated to be removed.

3.2 PORTABLE COVERINGS

A. For interior alterations, where acceptable to Engineer, flame-proofed drop cloths may be used. Flammable plastic sheet or film shall not be used within the building.

3.3 DEMOLITION

A. Plan of Operations: Establish procedures for safe removal of parts by methods that will not transmit excessive vibrations to or eccentric loads on building structure, create a nuisance, damage existing work that will remain, nor endanger either workmen, public, occupants nor adjacent work.

B. Supervision: Cut and demolish under supervision of a competent foreman, capable of identifying hazardous conditions and authorized to promptly take corrective action to eliminate them.

C. Precaution: Exercise care to avoid unnecessary damage to work that shall remain or stored for reinstallation.

D. Hole Cutting: Neatly cut holes where necessary. Keep area and debris covered to minimize creation of dust. Use care and adjust hole locations as required to minimize necessary cutting.

E. Finishes and Exposed Work: Cut to true and straight lines to permit satisfactory refinishing or connection to new work. Remove items to nearest full piece that is to remain.

3.4 OWNERSHIP OF MATERIALS

A. Salvaged materials that are to be relocated or remain the property of the Owner shall be carefully removed and stored on the site for reuse or disposition specified. Other materials become the property of Contractor and shall be removed and disposed of off the site.

3.5 SALVAGE OPERATIONS

A. Salvage existing materials/products identified to be reused or turned over to Owner. Carefully remove, collect, protect, repair, clean or restore to first class condition, relocate and reinstall where and as indicated. After cleaning and repairing salvaged items to be furnished to Owner, place in location on premises designated by Owner's representative.

3.6 REMOVAL

A. Remove materials/products/equipment which are not to be reused in the work in an orderly and careful manner so as not to endanger or damage adjacent work which is to

remain. When removing nails by claw hammer, place a small piece of wood under the hammer head to keep claws at right angle to the nail and prevent damage to the surface.

3.7 DISPOSAL

A. Haul rubbish, debris and unusable material away from the site promptly and dispose of legally. Burning on site is prohibited.

3.8 CLEANING

A. Clean surfaces as described in specifications.

3.9 CONCRETE

A. Exercise due caution in cutting and patching, chipping or general concreting so as not to deface that portion of the existing structure which is to remain. Should any such impairment occur, immediately clean or restore to original condition at no cost to Owner.

B. Do not cut or core existing, concrete slabs, columns, joist and beams.

C. Patch all existing slab penetrations caused by demolition of mechanical and plumbing with rated and UL listed seal assembly.

3.10 UTILITIES AND RELATED EQUIPMENT, PLUMBING, AND ELECTRICAL WORK

A. Protect existing utilities, storm, waste, water, fire protection, conduit racks, refrigerant pipes and raceways as indicated and as uncovered by the work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Engineer. If electrical, communications, fire protection and systems lines are encountered and not shown on drawings, contact the Engineer prior to the start of the work.

3.11 DRYWALL

A. Within the limits of the work, should any portion of existing drywall surfaces be deemed broken, scratched or unfastened, spackle with drywall compound, refasten or other wise repairs. Where indicated on the drawings for drywall to be removed remove the covering, base, drywall board, vapor barrier, insulation, metal furring and all fasteners.

B. Within the limits of the work make repairs to drywall partitions. Match adjacent surfaces or as indicated on the drawing.

C. Within the limits of tile work remove drywall ceiling and ceiling suspension system and supports, fasteners complete.

3.12 PATCHING

A. Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall flush with the adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish.

B. Where patching occurs on rated partition or fireproofed structure repair to match existing UL rated system to match code required hourly rating for assembly.

3.13 FIRESTOPPING AND DRAFT STOPPING

A. Fire stop existing holes at all masonry walls, floor slab & GWB Partitions.

B. Fire stop existing open ends of conduits:

C. Fire stop all existing plumbing penetrations at existing rated walls and floors.

D. Draft stop all penetrations into cavity of walls, ceilings, and attics. They include all penetrations created by new work or penetrations left by removal of existing proposed for replacement.

3.14. ACOUSTICAL LAY-IN CEILING

A. Remove and re-install existing acoustical ceiling and suspension system as required by the work U.O.N. on the drawings. If any portion of the existing ceiling is damaged by the G.C. it shall be replaced to match existing.

END OF SECTION 02070

SECTION 07841
THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through the fire-resistance-rated assemblies, including both new and existing empty openings and new and existing openings containing penetrating items.

B. Firestopping shall be designed and constructed in accordance with the Florida Building Code, Florida Fire Code and Uniform Fire Safety Standards as adopted by the State Fire Marshall and latest addendums

1.3 PERFORMANCE REQUIREMENTS

A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.

1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
3. Fire-resistance-rated roof assemblies.

4. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

5. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

   Penetrations located outside wall cavities.
   Penetrations located outside fire-resistive shaft enclosures.
   Penetrations located in construction containing fire-protection-rated openings.
   Penetrating items larger than 4-inch (100-mm-) diameter nominal pipe or 16 sq. in. (100 sq. cm) in overall cross-sectional area.

6. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.

7. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

8. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
9. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

10. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

1.4 SUBMITTALS

A. Product Data: For each type of through-penetration firestop system product indicated.

B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer.

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

D. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.

E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed through-penetration firestop systems similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Installer Qualifications: An experienced installer who is qualified by having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.

C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.

2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:

a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.

b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:

UL in "Fire Resistance Directory."

E. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Hilti Construction Chemicals, Inc.
Nelson Firestop Products.
3M Fire Protection Products.

2.2 FIRESTOPPING

A. General: Where UL-classified systems are indicated, they refer to the alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

C. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:

   Slag-/rock-wool-fiber insulation.
   Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   Fire-rated form board.
   Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. General: Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

I. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.4 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop 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.

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

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

2. Install fill materials for firestop systems by proven techniques to produce the following results:

3. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

4. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
5. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: The Contractor shall engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports.

B. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.

D. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.5 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Labels shall be installed above ceilings and in concealed spaces. Include the following information on labels:

1. The words: "FIRE AND SMOKE BARRIER PROTECT ALL OPENINGS".
   Contractor's name, address, and phone number.
   Through-penetration firestop system designation of applicable testing and inspecting agency.
   Date of installation.
   Through-penetration firestop system manufacturer's name.
   Installer's name.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop 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 through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

END OF SECTION 07841

SECTION 09510
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SCOPE

A. Selectively remove existing acoustical ceiling tile and suspension system as required by the HVAC work and store for reinstallation. Provide new acoustical ceiling tile and suspension system as required to replace all damaged ceiling tile and suspension system which cannot be reused and reinstalled.

B. Replace components as required or if damaged by the work.

1.3 SUBMITTALS

A. Product Data: Provide 6 copies of manufacturer's product specifications and installation instructions for each acoustical ceiling material required, and for each suspension system, including certified laboratory test reports and other data as required to show compliance with these specifications.

1.4 JOB CONDITIONS

A. Space Enclosure: Do not install interior acoustical ceilings until wet-work in space completed and nominally dry, and until work above ceilings completed, and until ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

PART 2 - PRODUCTS

2.1 CEILING UNITS

A. Acoustical Panels:

1. General: Provide lay-in panels with fissured textured to match existing ceiling tile. Material Fiber Acoustical Panels:

2. Products/Manufacturer: To match existing.

2.2 CEILING SUSPENSION MATERIALS

A. General:

1. Comply with ASTM C-635 for dimensional tolerances, coatings and finishes, as applicable to type of suspension system required for type of ceiling units indicated. Coordinate with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, soffits, fans and partition system (if any).

2. Structural Class: Intermediate-duty system. Individual component deflection shall not exceed 1/360 of the span.

3. Hanger Wires: Galvanized carbon steel, ASTM A-641, soft temper, prestretched, yield-stress load of at least 3 times design load, but not less than 9-gauge. install wire hangar at each corner of grid at light fixtures.

4. Type of System: Indirect-hung suspension system. Provide under the work of this Section, supplemental framing as required for proper spacing of hanger wires and other items suspended such as fans, and electric fixtures.

B. System Manufacturer:

1. To match existing.

C. Edge Moldings: Manufacturer's standard channel molding for edges and penetrations of ceiling, with single flange of molding exposed, white baked enamel finish unless otherwise indicated.

D. Exposed Suspension System: Manufacturer's standard exposed runners, cross-runners and accessories, of types and profiles indicated, with exposed cross runners coped to lay flush with main runners.

E. Finish of Exposed Members: Provide uniform factory-applied finish on exposed surfaces of ceiling suspension system, including moldings, trim, and accessories. Finish to match existing.

F. Finish: Provide hot-dipped galvanized finish (G-30 minimum on all ceiling suspension components. Exposed surfaces of suspension system component will receive a white baked on enamel paint. Color to match existing.

PART 3 - EXECUTION

3.1 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans wherever possible.
B. When removing the system exercise care so as not to damage system.
C. Coordinate with Owner’s representative for an interior air-conditioned space for storage of all removed components.

3.2 INSTALLATION

A. General

1. Install materials in accordance with manufacturer's printed instructions, and comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to work.

2. Arrange acoustical units and orient directionally-patterned units (if any) in manner shown by reflected ceiling plans.

3. Install tile with pattern running in one direction.

4. Install suspension systems to comply with ASTM C-636, with hangers supported only from building structural members or supplemental framing supported by building structural members. Locate hangers near each end and spaced 4'-0" along each

carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8" in 12'-0".

5. Secure wire hangers by looping and wire-tying, either directly to structures or supplemental framing.

6. Install edge moldings to type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.

7. Screw-attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0". Miter corners accurately and connect securely.

8. Install acoustical panels in coordination with suspension system instructions, with edges concealed by support of suspension members.

9. Scribe and cut panels to fit accurately at borders and at penetrations.

10. Do not use or install pop rivets in tracks.

11. Do not staple tracks to wall.

12. Install four support hangers at each corner of light fixtures and HVAC grille and diffusers.

13. Store material in HVAC space to acclimate following the manufacturer’s instruction for temperature and humidity.

3.2 ADJUST AND CLEAN

A. Clean exposed surfaces of acoustical ceilings including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

B. Replace damaged tiles or suspension system to match existing.

END SECTION - 09510

SECTION 15010
MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

B. Each Section within Division 15, Mechanical, shall conform to the requirements of the General Conditions of the Contract, including Supplementary General Conditions, Special Conditions, and all requirements of Division 1.

C. Each Section within Division 15, Mechanical, shall conform to the additional requirements of this Section, Mechanical General Provisions.

1.2 ARTICLES INCLUDED

A. Definitions.

B. Permits, Fees and Notices.

C. Applicable Publications.

D. Code Compliance.

E. Scope of Work.

F. Record Drawings.

G. Intent of Drawings and Specifications.

H. Quality Assurance

I. Submittals.

J. Product Requirements, Equals and Substitutions.

K. Manufacturers Instructions.

L. Transportation and Handling.

M. Storage and Protection.

N. Cutting, Patching and Demolition.

O. Cleaning Up/Removal of Debris.

P. Starting of Mechanical Systems.

Q. Operating and Maintenance Manuals.

R. Guarantee of Work.

S. System Testing.

1.3 ARTICLES

A. Definitions:

1. The term "As indicated" means as shown on drawings by notes, graphics or schedules, or written into other portions of contract documents. Terms such as "shown", "noted", "scheduled" and "specified" have same meaning as "indicated", and are used to assist the reader in locating particular information.
2. The term "Provide", means furnish and install as part of the work covered in Division 15.
3. The term "Furnish" means furnish only, for installation, as part of this contract, by other Divisions.
4. The term "Install only" means to install under the work of Division 15 equipment furnished by other Divisions, or by the Owner.
5. The term "Owner's Representative" when referenced herein shall be the Architect or the Engineer acting as his designated representative unless otherwise noted.
6. The term "design" as it pertains to the work of this division shall describe the basic intent, component sizing, component relationships and overall architecture of the HVAC, plumbing and fire protection system. The design is generally schematic in nature and will require specific detailing after the accepted products are determined.
7. The term "detail" as it pertains to the work of this division shall describe the work required by the contractor to assure a fully coordinated installation of the material and equipment supplied. When requested, the contractor shall produce detailed shop drawings or sketches indicating the actual placement of the equipment or material supplied; also including how the equipment or material interfaces with work of other sections or divisions within the contract documents.
8. The term "workman-like manner" as it pertains to the work of this division shall describe a neat well organized high quality installation system (duct, pipe, control wire or tube, conduit, etc.). Routing shall be well thought out providing adequate service clearance and maximum use of space. Equipment placement shall exhibit proper clearances for service. All lines (duct, pipe, control wire or tube, conduit, etc.) shall be run straight and true, parallel or perpendicular to building structure neatly supported.
9. For additional definitions refer to the General Conditions.

B. Permits, Fees and Notices: Comply with the General Conditions.

C. Applicable Publications:

1. Publications listed in each Section form a part of that Section to the extent referenced.
2. When a standard is specified by reference, comply with requirements of that standard, except when requirements are modified by the Contract Documents, or applicable codes establish stricter standards.
3. The Publication or Standard is the publication in effect as of the bid date, except when a specific date is listed.

D. Code Compliance:

1. 2006 Life Safety Code - NFPA 101
2. 2007 Florida Building Code including the 1st 2009 Supplement and the 2nd 2009 Supplement.
3. 2004 Florida Accessibility Code for Building Construction
4. 2008 National Electric Code (NEC)

5. 2007 Florida Building Code - Mechanical including the 1st 2009 Supplement and the 2nd 2009 Supplement.
6. 2007 Florida Fire Prevention Code (FFPC)
7. 2009 NFPA Standards

E. Scope of Work: The work to be performed under this Division consists of the satisfactory completion of all HEATING, VENTILATING, AIR CONDITIONING as indicated in the Contract Documents.

F. Record Drawings: Comply with the General Conditions.

G. Intent of Drawings and Specifications:

1. The intent of the drawings and specifications is to establish minimum acceptable quality standards for materials, equipment and workmanship, and to provide operable mechanical systems complete in every respect.
2. Existing conditions, dimensions, etcetera, depicted on the drawings are taken from the "as-built" drawings of the original construction supplemented by field observation. The contractor is cautioned to field verify all existing conditions, dimensions, etcetera, notifying the Owner's Representative of any discrepancies other than those minor in nature, for direction, prior to ordering or fabricating equipment or materials. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawing and specifications, the more stringent shall govern, unless the discrepancy conflicts with applicable codes, wherein the code shall govern.
3. The drawings are diagrammatic, intending to show general arrangement, capacity and location of system components, and are not intended to be rigid in detail. Final placement of equipment, other system components, and coordination of all related trades shall be the contractor's responsibility.
4. Due to the small scale of the drawings, and to unforeseen job conditions, all required offsets and fittings may not be shown but shall be provided at no additional change in contract cost.
5. In the event of a conflict, the Owner's Representative will render an interpretation in accordance with the General Conditions.

H. Quality Assurance:

1. All equipment furnished under this Division shall be listed and labeled by U.L., ETL or a nationally recognized testing laboratory (NRTL).
2. Material furnished under this Division shall be standard catalogued products of recognized manufacturers regularly engaged in the production of such material and shall be the latest design.
3. Materials shall be the best of their respective kinds. Materials shall be new except where the specifications permit reuse of certain existing materials.
4. Work provided for in these specifications shall be constructed and finished in every part in a workmanlike manner.
5. All items necessary for the completion of the work and the successful operation of a product shall be provided even though not fully specified or indicated on the drawings.
6. All work to be performed by qualified and experienced personnel specifically trained in their respective field.
7. All work of this division shall be carefully interfaced with the work of other divisions to assure a complete, functioning system or systems.

I. Submittals:

1. In addition to all other submittal requirements elsewhere in the contract documents, the contractor shall comply with the following.
2. Submittal for acceptance is required only on those items specifically requested in the specification section that applies.
3. For products and equipment that do not require a submittal for acceptance, submit a separate letter for each specification section certifying that all products and equipment will be provided in compliance with the contract documents.
4. Provide submittal data in accordance with the General Conditions and/or as listed below.
5. Designate in the construction schedule, or in a separate coordinated schedule, the dates for submission and the dates that the submittals will be needed in order to meet construction schedule. This schedule shall be submitted prior to or in conjunction with the first submittal. Processing of submittals may be delayed pending the receipt of this schedule at the reviewer's discretion.
6. Submittal data shall be presented in a clear and thorough manner and referenced to the specification section.

    a. Where applicable, data shall be identified by reference to sheet and detail, schedule or room numbers, equipment or unit number as shown on Contract Drawings.

7. Prepare performance and product data as follows:

    a. Clearly mark each copy to identify pertinent products or models, delete non-pertinent data.
    b. Show performance characteristic and capacities.
    c. Show dimensions and clearances required.
    d. Show wiring or piping diagrams and controls.
    e. Clearly list any deviation in the submittals from the requirements of the contract documents.
    f. Include installation requirements.

8. Manufacturer's standard schematic drawings and diagrams:

    a. Modify drawings and diagrams to delete information not applicable to the work of this project.
    b. Supplement standard information to provide information specifically applicable to the work of this project.

9. Prohibition of Asbestos and PCB:

    a. The use of any process involving asbestos or PCB, and the installation of any product, insulation, compound of material containing or incorporating asbestos or PCB, is prohibited. The requirements of this specification for complete and operating mechanical systems shall be met without the use of asbestos or PCB.
    b. Prior to the Final Review field visit the Contractor shall certify in writing that the equipment and materials installed in this Project under this Division 15 contain no asbestos or PCB. Additionally, all manufacturers shall provide a statement with their submittal that indicates that their product contains no asbestos or PCB. This statement shall be signed by a duly authorized agent of the manufacturer.

10. Letter of Certification: Where a submittal is not required, provide letter certifying

that the work will be completed in strict accordance of the specified requirements. In the event the contractor wishes to alter the requirements of the specification for whatever reason, this should be clearly explained in this letter noting that this alteration may require additional submittal requirements.

11. Schedules: Where schedules are called for, submit schedule indicating which products will be used and to what extent by system, location, size, etc.

12. Where samples are requested, samples shall be of sufficient size and quantity to clearly illustrate:

    a. Functional characteristics of the product, with integral related parts and attachment devices.
    b. Full range of color, texture and pattern.
    c. Where a mock-up is specified, erect at the Project site, in a location acceptable to the Owner's Representative. Size or area shall be that specified or as agreed upon during pre-construction or other job site meetings.
    d. Where mock-up is not a permanent part of the installation, remove mock-ups at conclusion of work or when acceptable to the Owner's Representative.

13. The Contractor shall:

    a. Review Shop Drawings, Product Data and Samples prior to submission.
    b. Determine and verify:

        1) Field measurements.
        2) Field construction criteria.
        3) Catalog numbers and similar data.
        4) Conformance with specifications.
        5) All submittals have been properly interfaced with the requirements of this and other divisions of work so as to assure a complete, functioning system in accordance with the contract documents.

    c. Coordinate each submittal with requirements of the work and of the Contract Documents.
    d. Clearly identify any deviations in the submittals from requirements of the Contract Documents. Any deviations not specifically disclosed in the submittal shall be solely at the risk of the Contractor, and shall be subject to discovery at any time. Any undisclosed deviations shall be corrected by the Contractor to comply with the requirements of the Contract Documents at no cost to the Owner regardless of the action code accorded the submittal by the Owner's Representative.
    e. Do not release equipment for shipment, begin fabrication or work on any items requiring submittals for acceptance until all submittals are returned with the Owner's Representative acceptance.
    f. Make submittals promptly, and in such sequence as to cause no delay in the work or in the work of any other contractor.

14. Number of Submittals: Comply with the General Conditions.

15. Submittals shall contain:

    a. The date of submission and the dates of any previous submissions.

b. The Project title and number.
c. Contract identification.
d. The names and phone numbers including personal contact of:

1) Contractor.
2) Supplier.
3) Manufacturer.

e. Identification of the product, with the specification section number and contract document description clearly indicated.
f. Field dimensions, clearly identified as such.
g. Relation to adjacent or critical features of the work or materials.
h. Applicable standards.
i. Identification of deviations from Contract Documents.
j. Identification of revisions on re-submittals.
k. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.
l. Each submittal shall be limited to a single specification section. Submittals shall not be grouped with other sections in common binders or under common control sheets except as defined in paragraph m. below. Each submittal shall have a cover/control sheet containing the information listed above (a thru k) and have a minimum of 8" x 3" clear space for the general contractors, engineers and architects review stamp.
m. The first group of submittals shall be sent in a minimum of one (or if required) two hard cover view type 3-ring binder(s) White, sized to hold 8-1/2” x 11” sheets:

1) Binder is to be adequately sized to comfortably hold required submittals. Minimum spline size to be 1”, maximum spline size to be 3” (provide additional binders if 3” size is not sufficient to properly hold submittals).
2) Binder cover and spline to have outer clear vinyl pockets. Provide correct designation of project in each pocket. Description sheets are to be white with black letters, minimum of 11” high and full width of pocket. Description is to describe project and match project drawing/project manual description.

n. Submittals not complying with these requirements may be returned with no action taken at the reviewer’s discretion.

16. Re-submittals shall contain:

a. The date of re-submission and the dates of all previous submissions.
b. A copy of the Engineer's comments from the previous submittal.
c. An itemized response to each of the Engineer's comments specifically outlining the changes or corrections being made. As an example; this could be either noting the page(s) of the previous submission that are affected and what changes have been made or noting specific additional information being provided.
d. Submittals not complying with these requirements may be returned with no action taken at the reviewers discretion.

17. The Owner's Representative will:

a. Review submittals promptly and where special attention is requested, review in accordance with the schedule required.
b. Review the submittal for general compliance with the contract documents. The contractor is responsible for quantities, dimensions, placement of the product, coordination with all other trades occupying the space, maintain service clearance, function and compliance with the written installation instructions.
c. Determine the appropriate action for the submittal. Action codes will be as follows:

Action	Description
No exceptions noted.	No exceptions taken.
Make corrections noted.	Resubmittal not required. Make corrections to exceptions noted.
Revise and resubmit.	Make corrections to exceptions noted and resubmit.
Rejected	Not in compliance with contract documents. Resubmit
Submit Specific Item	Resubmit item as specified.
Review not required	Not required for review. No action taken. Copy retained for reference.

d. Turn around time will generally be within 14 calendar days on properly prepared submittals unless otherwise noted in Division 1.
e. Review comments will generally be on a separate attached sheet.

18. Resubmission requirements for "as specified" products.

a. Make any corrections or changes in the submittals required by the Owner's Representative and resubmit until accepted.
b. A submittal shall only be reviewed a maximum of 3 times. If upon the second resubmission an accepted action cannot be rendered (No Exceptions Noted or Make Corrections as Noted), the contractor shall supply the basis of design product and bear all costs incurred by the Owner's Representative during the review process until an accepted submittal is achieved.

19. The Contractor shall maintain one copy of all accepted submittal data including letters of compliance in a job site file.

J. Product Requirements, Equals and Substitutions:

1. In addition to all other requirements for submittals, equals and substitutions elsewhere in the contract documents, the contractor shall comply with the following.
2. Product Requirements:

a. The specifications sections under Article 2.1 "ACCEPTABLE MANUFACTURER", lists suppliers found acceptable for this project. The names listed are manufacturers who meet the minimum acceptable standards that this project dictates. The list is furnished as a guide. Even though a manufacturer is named, he must still provide the type and quality of equipment specified as well as equipment that will fit within the allotted space and within the design weight allowance, etc. Being named

does not imply permission for that manufacturer to provide an alternative product or design. Other manufacturers not named will be considered to be equal providing they furnish a product of the type and quality specified.

b. In certain cases, foundations and/or structural supports or electrical requirements for equipment specified in this Division are provided under other divisions of the specifications. Where an alternate acceptable manufacturer's product is provided, this contractor shall coordinate the revised requirements and include an allowance for any cost differential.

c. If the list, under Article 2.1 "ACCEPTABLE MANUFACTURERS" names only one manufacturer followed by "No Substitutions" that product shall be supplied.

3. Substitutions.

a. A substitution is defined as any product not meeting the requirements as outlined in PART 2 - PRODUCTS. A different design accomplishing the same result will be considered a substitution. The same design requiring a larger motor, or more space or a structural change to accommodate larger weight, etc., will be considered a substitution. If a manufacturer who is not listed as an "ACCEPTABLE MANUFACTURER" wants to have his product considered as an equal or as a substitution, he shall submit details to the Owner's Representative 10 days in advance of bid date and a decision will be rendered. If necessary, a clarification will be issued in the form of an Addendum. No substitution requests shall be considered after the Bid.

b. Submit a separate request for each product, supported with complete data, with drawings and samples as appropriate, including.

1) Comparison of the qualities of the proposed substitution with that specified in tabulated format.
2) Changes required in other elements of the work because of the substitution.
3) Effect on the construction schedule.
4) Cost, extra credit or statement of no change in contract price.
5) Any required license fees or royalties.
6) Availability of maintenance service, and source of replacement materials.

c. The Owner's Representative shall be the judge of the acceptability of the proposed substitution.

d. A request for a substitution constitutes that the Contractor:

1) Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified.
2) Will provide the same warranties for the substitution as for the product specified.
3) Will coordinate the installation of the substitution into the work, and make such other changes as may be required to make the work complete in all respects.
4) Waives all claims for additional costs, under his responsibility, which may subsequently become apparent.
5) Will absorb all costs incurred by the substitution when affecting other trades including but not limited to electrical, structural, architectural, etc.
6) Will absorb any cost incurred by the Owner's Representative in

review of the substituted product if the acceptance of the substituted item creates the need for system modification and/or redesign, or if the substituting contractor exhibits negligence in his substituting procedure thus submitting inferior, misapplied or miss-sized equipment. In the event of additional engineering costs the billing structure shall be agreed upon prior to review by all involved parties.

4. Owner's Representative will review requests for substitutions with reasonable promptness, and will issue an addendum or notify Contractor, in writing, of the decision to accept or reject the requested substitution.
5. The Owner's Representative will review substitution submittals for compliance a maximum of two times. If the submittal or substituted product does not comply with the contract documents on the second submittal, the submittal and product will be rejected and the specified product will be required.
6. The contractor may request further review of the substitution after the second submittal rejection if the contractor agrees in writing to accept responsibility for the cost of additional review time and expenses by the Owner's Representative.
7. In the event a substitution is rejected, supply the products which constituted the basis of design at no change in the contract price.

K. Manufacturer's Instructions:

1. Installation of work shall comply with manufacturer's printed instructions.
2. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Owner's Representative for clarification. Do not proceed with work without clear instructions.

L. Transportation and Handling: Comply with General Conditions.

M. Storage and Protection:

1. Store products in accord with manufacturer's instructions, with seals and labels intact and legible.
2. Store products to prevent damage by the elements. Space temperature shall be controlled as required to prevent condensation and metal corrosion or damage to electrical or electronic parts are the result of condensation.
3. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.
4. Provide protection as necessary to prevent damage after installation.
5. Products which suffer damage due to improper storage shall not be installed and if found in place, shall be removed and replaced at the contractors expense.

N. Cutting and Patching: Comply with the General Conditions.

O. Cleaning Up/Removal of Debris:

1. Comply with the General Conditions.
2. Maintain a clean work area. Construction debris shall be immediately removed from all newly erected work.

P. Starting of Mechanical Systems:

1. Provide material and labor to perform start-up of each respective item of equipment and system prior to beginning of test, adjust and balance procedures.

2. Provide labor to assist the Owner's Representative in acceptance review.
3. Provide point by point system check-out. Submit results in tabulated form by system. Include this data as part of Operation and Maintenance Manuals.
4. Provide information and assistance and cooperate with test, adjust and balance services.
5. Comply strictly with manufacturer's recommended procedures in starting up mechanical systems.
6. Provide such periodic continuing adjustment services as necessary to ensure proper functioning of mechanical systems until acceptance and up to 1 full year after date of Owner acceptance.

Q. Operating and Maintenance Manuals:

1. Quantity: Four (4) sets
2. Format: Adequately sized for contents, minimum 1" and maximum 3" spline size, hard cover, view type, 8-1/2" x 11 loose leaf binders. Binder covers to have outer clear vinyl pocket on front cover and spline. Provide correct project designation and contents description in each pocket. Use as many as required. Do not overload binders.
3. Content:

    a. Cover sheet.
    b. Table of contents (as follows):

        1) Description of systems.
        2) Design parameters.
        3) Section 15010 - Mechanical General Provisions
                thru
        4) Section 15870 – Grilles, Registers and Diffusers

    c. Point by Point System Check-out: Provide tabulated results indicating compliance with contract document requirements.

5. Detailed Preparation Requirements:

    a. The cover sheet shall list: project name, location, architect, structure engineer, mechanical engineer and electrical engineering firm name with address, telephone number and project managers name for this project.
    b. Each major heading in the table of contents shall have a large distinctive, clearly marked, non-erasable, plastic encased tab.
    c. The description of systems will be provided by the design engineer for insertion at the time of review and turn-over to owner. This description of systems will be an updated version of the narrative included in Section 15010 - Mechanical General Provisions and will be an overview of the entire system. It will be the basis for the starting of the owners instruction program.
    d. Each section shall have the following sub-tabs. Sub-tabs shall be similar to the main tabs but of a different color.

        1) Specifications: The specification shall be copied and inserted complete with all addenda.
        2) Submittal: This section shall include all accepted submittal data. If submittal was not required, include technical data as specified.
        3) Installation Instructions: If the product, such as pipe, etc., does not have any written installation instructions, include a statement "Manufacturer's Written Installation Instructions not Available -

Product Installed in Accordance with Specifications and Good Practice".

4) Operation and Maintenance Instructions: These shall be the written manufacturer's data edited to omit reference to products or data not applicable to this installation.
5) Parts List: These shall be edited to omit reference to items not applying to this installation.
6) Equipment Supplier: This section shall include the name, address and telephone number of the manufacturer's agent and/or service agency supplying or installing and starting up of the equipment.
7) System Description: This section shall include that portion of the overall description included in the beginning of the manual as it applies to each sub-section. In sections such as pipe, valves and fittings, a statement shall be included "Not Applicable to this Section." Data for this section will be added by the design engineer when the manuals are submitted for review and forwarded to the owner.
8) Controls Description: This will be included in each section covering controlled equipment. It will include the description from the approved temperature control submission, complete with schematic diagram showing piping arrangement and control location on 8-1/2" x 11" or 11" x 17" sheet. This data shall be provided by the temperature controls contractor in a form suitable for insertion by the mechanical contractor and for review by the design engineer.
9) Special Operating Instructions: This section shall include condensed instructions for start-up, shut-down, emergency operation, safety precautions and troubleshooting suggestions. Where control is clearly covered in controls description, it is not to be duplicated here.
10) Preventative Maintenance Instructions: This section shall include excerpts from the manufacturer's written instructions on weekly, monthly, quarterly, annually, etc. This summary shall be prepared by the mechanical contractor with help from the equipment supplier. It will be reviewed by the engineer prior to turning over to the owner.

e. Section 15051 - Adjusting, Balancing and System Testing shall contain the following sections:

1) Specifications.
2) Submittal.
3) TAB Data.

This shall be the final TAB data. It will probably have to be added after the owner has received his training and the O&M manuals. Payment for TAB work will be withheld until the data is received and accepted. and the TAB instructed session is complete. The contractor shall provide a separate binder complete as detailed in this article as part of the set. The engineer will be responsible for incorporating this data into the O&M manuals.

6. Submittal Requirement:

a. The O&M manuals shall be submitted at the 30% completion stage.

b. In order to ensure that this is done and to give a reasonable time for compliance, any progress payments for mechanical work past the 60% completion stage will be held up until this submittal requirement is met.

R. Guarantee of Work:

1. Comply with the General Conditions.
2. Where applicable, furnish manufacturer's written warranty for materials and equipment.
3. Insert warranties in appropriate locations in operating and maintenance manuals.
4. Materials and equipment having seasonal operation limitations, shall be guaranteed for a minimum of one year from date of seasonally appropriate test, and acceptance in writing by the Owner, unless specific Division 15 specifications specify a longer period.

S. System Testing:

1. Provide all necessary labor, materials and equipment to successfully complete all system testing necessary for building occupancy and owner acceptance.
2. Provide all necessary labor, materials and equipment to assist contractors of other division to complete system testing necessary for building occupancy and owner acceptance, wherever an inter-relationship between Division 15 and the work of other divisions exists.
3. Tests shall be repeated as necessary until all occupancy and operation permits are granted and the owner accepts the project.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 15010

SECTION 15020
DEMOLITION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

B. Provisions of Section 15010, Mechanical General Provisions, shall be made an integral part of this section.

1.2 WORK INCLUDED

A. Heating, Ventilation and Air Conditioning: Remove all existing heating, ventilating and air conditioning equipment as shown on the Contract Documents.

PART 2 – PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall obtain the permission of the Owners Representative and coordinate with other trades prior to commencement of demolition of the existing installations.

B. The Contractor shall provide for safe conduct of the work, protection of property, and coordination with other work in progress. The spread of dust and flying particles shall be minimized.

C. Existing construction to remain shall be protected from damage. Work damaged by the Contractor shall be repaired to match existing work.

D. When indicated, the contractor shall remove specific equipment in a careful manner so as to maintain the equipment in proper operating order. This equipment will be turned over to the owner and transported to a storage area as directed by the owner and further described herein.

E. Material demolished under this section shall become the property of the Contractor and shall be promptly removed and disposed of off the site.

F. Debris and rubbish shall not accumulate on the site, and shall be disposed of periodically by the Contractor.

G. All necessary precautions shall be taken by the Contractor to prevent spillage during removal activities. Pavement and areas adjacent to the demolition areas shall be kept clean and free from mud, dirt and debris at all times.

H. Existing utilities and mechanical systems including related equipment shall be disconnected by the Contractor to the extent shown on the contract drawings or specified and as required to perform the work in accordance with Division 15 of the specifications.

I. The Contractor shall exercise care during the progress of the work under this section so as not to damage or displace the work of the other trades performed under other sections. He shall coordinate work under this section with work under other sections, as

necessary for the proper execution of the entire work.

J. When the contract documents indicate the removal of existing equipment to be temporarily stored and to be re-used, the contractor shall provide adequate protection for the stored equipment including the proper capping of several pipe connections, protection of power and control wiring and devices, and draining of coils to prevent freezing damage.

END OF SECTION 15020

SECTION 15050
BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

B. Provisions of Section 15010, Mechanical General Provisions, shall be made an integral part of this section.

C. Provisions of Division 7 for Waterproofing and Flashing and Fire and Smoke Stopping requirements.

1.2 WORK INCLUDED

A. Access doors.

B. Equipment identification.

C. Fire and smoke stopping.

D. Electrical requirements.

E. Placing of equipment.

1.3 RELATED WORK

A. DIVISION 7 - THROUGH-PENETRATION FIRESTOP SYSTEMS.

1.4 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Section to the extent referenced.

1. American Institute of Steel Construction (AISC) Publications
2. American National Standards Institute (ANSI) Standards
3. American Society for Testing and Materials (ASTM) Publications
4. American Welding Society (AWS) Publications
5. Underwriters Laboratories, Inc. (UL) Standards

1.5 SUBMITTALS

A. Where submittals are required, comply with Section 15010 Mechanical General Provisions.

B. Submit drawings of fabricated steel supports where proposed supports are not in accordance with details on drawings, or where drawings do not detail supports. Submittal for acceptance is required.

C. Submittal for other than fabricated steel supports is not required. Product data for the following shall be included in the operation and maintenance manuals. Submittal for acceptance is not required.

1. Access doors.
2. Equipment identification.

3. Fire and smoke stopping material.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Access Doors:

1. Acudor
2. Elmodor Manufacturing, Co.
3. Karp Metal Associates, Inc.
4. Larsen's Manufacturing Co.
5. Milcor

B. Equipment Identification:

1. Communications Technology Corp.
2. Craftmark Identification Systems, Inc.
3. EMED Co., Inc.
4. Florida Marking Products, Inc.
5. Marking Services, Inc.
6. Seton Name Plate Corp.
7. W.H. Brady Co., Signmark Division

C. Fire and Smoke Stopping Material:

1. General Electric Company.
2. Hilti, Inc.
3. International Protective Coatings Corp. (IPC) Division of Grace Construction Prod.
4. Johns Manville
5. Rectorseal
6. Tremco, Inc. Sealant/Weatherproofing Division
7. 3M Fire Protection Products.

2.2 FABRICATION

A. Access doors:

1. Access doors: UL labeled where installed in fire rated walls, partitions, and ceilings. Door rating shall be not less than wall, partition, or ceiling rating.
2. Frames: 16 gauge steel, flush trim, with corners welded and ground smooth, masonry anchor strap for masonry walls, bolt holes for mounting in framed openings.
3. Non-fire rated doors: 13 gauge steel, concealed continuous piano hinge with dust flap, flush screwdriver operated lock with stainless steel cam and studs.
4. Fire rated doors: 20 gauge steel welded pan type, concealed continuous piano hinge with stainless steel pins, key-operated latch bolt, interior latch release, automatic door closer, automatic door latch when door closes. The door panel shall contain 2- inch thick insulation in sandwich type construction.
5. Finish of doors and frames: Prime coat of rust inhibitive baked enamel, except as specified otherwise.
6. Finish of doors and frames in wet areas, and in areas with surfaces subject to wet cleaning: No. 4 satin stainless steel.

B. Equipment Identification:
1. Equipment nameplates:

a. Indoor: Shall be 1/16 inch thick plastic with black satin surface and white core. Lettering shall be engraved through the surface color to expose the core color. Plate size shall be a minimum of 2-1/2 inch by 4 inch, with 3/4 inch high lettering for equipment and 3/4 inch by 2-1/2 inch, with 3/16 inch high lettering for ceiling grid labeling. Equipment identifying name and number shall be in accord with schedules on the Contract Documents. Plate manufacturer shall furnish pre-drilled hole locations for pop riveting. Where pop riveting is not suitable, a suitable adhesive for permanently attaching plate to equipment shall be provided.
b. Based on Marking Services Inc. Model MS-215 Max-Tex.

C. Fire and Smoke Stopping: Refer to Division 7 for extensive requirements. Fire and smoke stopping material: A one-part silicone elastomer, or a one-part intumescent elastomer caulk or putty, UL classified and FM approved with flame spread of 0 and smoke development not to exceed 50 in accord with ASTM E84. Material shall be suitable for penetration seals through fire-rated floors and walls when tested in accord with ASTM E814 under positive pressure. Material shall not melt or soften at high temperatures, shall be suitable for direct outdoor and ultraviolet exposures, shall cure to give a tight compression fit, and shall not produce toxic fumes. Material, when heated, shall expand to fill and hold penetration closed where burn out of cable insulation or ATC tubing occurs.

D. Electrical Requirements: Product description not applicable to this Section.

E. Placing of Equipment: Product description not applicable.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation of materials and equipment shall be in accord with the manufacturer's written instructions, except as specified.

3.2 INSTALLATION

A. Access Doors:

1. Deliver access doors to the appropriate trade well in advance of the time they are needed so as to avoid unnecessary delay of the work.
2. Access doors shall be sized as indicated on drawings. If no size is given, provide access door of size suitable for servicing equipment or valve. Unless otherwise noted, the minimum size for a access door shall be 12" x 12".
3. Access doors shall be provided where indicated and if not indicated, where required.
4. Access doors shall be installed so as to allow full door swing.
5. Where full swing and access is not possible, removable doors shall be provided.
6. Access doors not required in lay-in-tile ceilings.

B. Equipment Identification:

1. Provide a marker for each equipment to be tagged, located above lift-out tile ceilings. The marker shall be 1/16 inch thick plastic with a satin surface and white core. Lettering shall be engraved through the surface color to expose the core color. Plate size shall be ¾ inch by 2-1/2 inch, with 3/16 inch high lettering for ceiling grid labeling. Plate manufacturer shall furnish suitable adhesive for permanently attaching plate to ceiling grid.
2. Permanently affix nameplate to each item of equipment using stainless steel pop rivets. Where irregular surface impede direct attachment of plates, affix plate to

sheet metal bracket and attach bracket to equipment with screws, bolts or suitable adhesive from nameplate manufacturer.

C. Fire and Smoke Stopping:

1. Refer to Division 7 for further requirements.
2. Fire and smoke stopping shall be provided as required to meet all code requirements and at a minimum is required in the following locations:

   a. Where exposed and concealed horizontal pipes, tubes, wires and ducts which are part of an active smoke control system that are not provided with fire dampers penetrate fire rated walls, shaft walls, and smoke barriers.
   b. Where exposed and concealed vertical pipes, tubes, and wires ducts which are part of an active smoke control system that are not provided with fire dampers penetrate rated and non-rated floors.

3. Provide pipe or duct sleeve for all penetrations. Space between pipe or duct and sleeve shall not exceed the UL listing of the penetration.
4. Fill annular space between pipe and sleeve, or between duct and sleeve on non-dampered penetrations, with approved material.
5. Depth of material shall be in accord with laboratory tests for 1, 2, or 3 hour rated assemblies.
6. Damming material may be temporary non-fire approved, or permanent fire-approved. Where permanent fire-approved damming material is used depth of fire and smoke stopping material may be decreased in accord with manufacturer's recommendations. Temporary damming material shall be removed after installation of fire and smoke stopping material.
7. Seal all gaps or voids in cured foam with material to match the fire and smoke stopping material.
8. Trim excess cured foam from around all openings and leave smooth, flush surface.

D. Electrical Requirements:

1. Electrical apparatus, devices, controls, etc., required but not specified in detail in this Division shall conform to Division 16 - ELECTRICAL.
2. Except as otherwise detailed or specified, all power wiring required to operate electrical devices and equipment furnished in this Division will be provided under Division 16 - ELECTRICAL.
3. Control and interlock wiring required for all electrical devices and equipment furnished under Division 16 – ELECTRICAL.

E. Placing of Equipment:

1. Coordinate setting of equipment with the requirements of other trades so as to avoid conflicts and to insure compatibility. Equipment shall not block access for installation of other equipment.
2. Adjust suspended equipment to final elevation prior to making pipe, duct or electrical connections.
3. Exercise caution during equipment placing operations to insure that structure is not overloaded.
4. Do not move heavy equipment across floor or roof of insufficient load bearing capacity to support such equipment. Provide bracing or shoring as required, or use crane to place equipment directly on permanent and finished support.

END OF SECTION 15050

SECTION 15090
SUPPORTS, HANGERS, ANCHORS AND SLEEVES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

B. Provisions of Section 15010, Mechanical General Provisions, shall be made an integral part of this section.

1.2 WORK INCLUDED

A. Duct Hangers and Supports.

B. Duct Sleeves.

1.3 QUALITY ASSURANCE

A. Duct hangers and supports shall be in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible as applicable.

1.4 APPLICABLE PUBLICATIONS

A. Applicable sections of the publications listed below form a part of this Section. The publications are referenced to in the text by the basic designation only.

1. American Institute of Steel Construction (AISC)
2. American National Standards Institute (ANSI)
3. American Society for Testing and Materials (ASTM)
4. American Welding Society (AWS)
5. The Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS)
6. Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA)

1.5 SUBMITTALS

A. Product data, along with installation operation and maintenance instructions, shall be included in the operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Duct Hangers and Supports: Fabricated per Specifications

B. Duct Sleeves: Fabricated per Specifications

2.2 FABRICATION

A. Duct Hangers and Supports: Fabrication and application of duct hangers and supports

shall be in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, Latest Edition, as applicable.

B. Duct Sleeves: Sleeves shall be provided for ducts penetrating concrete and masonry walls, stud framed fire rated walls, and poured- in-place concrete floors and roofs. Sleeves shall be sized to accommodate duct, insulation and firestopping. Refer to Division 7 for firestopping requirements.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Where applicable install in accordance with the manufacturers written installation instructions.

B. Where supports are in contact with copper pipe provide copper plated support, or wrap pipe with sheet lead.

C. Where supports are in contact with glass, aluminum or brass pipe provide plastic coating on supports, or wrap pipe with sheet plastic.

3.2 INSTALLATION

A. Duct Hanger and Supports: Installation of duct hangers and supports shall be in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, Latest Edition, as applicable.

B. Duct Sleeves:

1. Secure sleeves to forms for concrete construction. Ensure sleeves are not disengaged or misaligned by concrete placement operations.
2. Provide temporary cap for open end of sleeves to prevent entrance of concrete.
3. Provide temporary internal bracing where required to prevent distortion of sheet metal sleeves by concrete placement operations.
4. Sleeves shall not be installed in structural members, except where indicated or approved.
5. Furnish sleeves to masonry contractor in advance of masonry work. Furnish dimensioned drawings indicating exact location of sleeves.
6. Each sleeve shall extend through its respective wall, floor, or roof, and shall be cut flush with each surface, except as indicated otherwise.
7. Sleeves passing through floors in wet areas, such as areas containing plumbing fixtures or floor drains, shall extend a minimum of 4 inches above the finished floor. Sleeves in wet areas shall be enclosed with 4 inch concrete curb.
8. Unless otherwise indicated, sleeves shall be of a size to provide a minimum of 1/4 inch clearance all around between the duct and inside of sleeve, or between jacket over insulation and sleeve.
9. Provide membrane clamping devices on sleeves for waterproof floors.
10. Duct sleeves shall be secured to opening and have a flange turned back to wall to cover any irregularities in the opening provided for the sleeve.

END OF SECTION 15090

SECTION 15250
INSULATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

B. Provisions of Section 15010, Mechanical General Provisions, shall be made an integral part of this section.

1.2 WORK INCLUDED

A. Duct Systems Insulation.

B. Accessories.

1.3 QUALITY ASSURANCE

A. All products within the conditioned air stream or active plenums shall comply with the NFPA 90A Flame/Smoke rating of 25/50 and comply with UL 181 erosion limitations. Fire hazard ratings shall be as determined by NFPA-255, "Method of Test of Surface Burning Characteristics of Building Materials" - ASTM E84 or UL 723.

B. All adhesives, cements, finishes, jackets, etc., shall be UL listed or labeled for use as applied to insulation and designed specifically for use in the installation.

C. All insulation shall be installed in accordance with National Commercial & Industrial Insulation Standards (NCIA).

1.4 SUBMITTALS

A. Submit schedule indicating type of insulation, thickness, vapor barrier or coating by system and size.

B. Product data, along with installation operation and maintenance instructions, shall be included in the operation and maintenance manuals.

C. Submit details of insulated removable covers using the actual equipment dimensions, concrete base sizes and piping arrangements.

D. Refer to Section 15010, Mechanical General Provisions for requirements.

1.5 GENERAL REQUIREMENTS

A. Factory-applied insulation is specified under the applicable equipment Section of these specifications. It is listed here for reference only.

B. Acoustical duct liner is specified under Section 15840 - Shop Fabricated Ductwork. It is listed here for reference only.

C. Packages and standard containers of materials shall be delivered unopened to job site and shall have the manufacturer's label attached giving a complete description of the material.

1.6 DEFINITIONS

A. The term "exposed" means exposed to view in finished spaces, in equipment rooms, in fan rooms, in closets, in utility corridors, in tunnels, on roof, in storage rooms, and in other spaces as indicated.

B. The term "concealed" means concealed from view, and includes all spaces not defined as exposed.

C. The term "unconditioned" space shall mean all places where the temperature surrounding the pipe has not been conditioned consistent with conditioned spaces, and shall include mechanical equipment rooms, non-active ceiling plenums, and non-accessible chases. This term shall also include conditioned spaces where the humidity levels are allowed to rise above 70% RH.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Fiberglass Insulation:

1. Owens-Corning Fiberglas
2. Knauf Fiberglass
3. CertainTeed
4. Johns Manville

2.2 DUCT INSULATION AND FIREPROOFING REQUIREMENTS – Refer to Construction Documents.

2.3 MATERIALS

A. Duct Insulation:

1. Blanket Fiberglass: Flexible fibrous glass, flame retardant factory laminated foil-skrim-kraft (FSK) vapor barrier, 2" stapling flange, maximum vapor permeance of .02 perm/in., minimum density of 1.5 lb/cf, maximum conductivity per 1" thickness of .28 at 75°F mean temperature. Based on Knauf Duct Wrap.

B. Accessories:

1. Glass Cloth Pipe, Duct and Equipment Jacket: Glass lagging cloth, 8 oz/sy treated weight. Secure with elastomeric insulating adhesive on elastomeric insulation, for fiberglass insulation use appropriate mastic finish as recommended by the insulation manufacturer with the perm rating of the mastic equal to or less than that of the insulation it is sealing.
2. Corner angles shall be minimum 28 gauge, 1 inch by 1 inch aluminum adhered to 2 inch by 2 inch heavy kraft paper.
3. Glass tape shall be a minimum density of 1.6 ounces per square yard, 4 inch wide with a 10 x 10 thread count per inch of width. Glass cloth shall be untreated.
4. Staples shall be outward clinching type, Type 304 or 316 stainless steel in accord with ASTM A 167 or Monel® coated.
5. Wire shall be soft annealed galvanized, or copper, 16 gauge, or nickel copper alloy.
6. Vapor Barrier Mastic: Air drying flexible water based mastic used for applying a vapor barrier joint with glass cloth at insulation joints. Suitable for temperatures to 180°F, wet and dried film not to exceed 25 for flame spread and 50 for smoke development when tested per ASTM E 84-84A method. Maximum Perm rating of

0.08. , Childers Products Company, Inc. CP-35 Chil Therm® WB, Foster Products Corp. Product Data 30-80 Foster Vapor Safe® Coating, Marathon Industries, Inc. 590 LO-PERM, Richard's Paint Manufacturing CO., Inc. VBM-4, Vimasco Corp. 749 Vapor-Blok, or equal.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Install all insulation in strict accordance with the manufacturers written installation instructions.

B. All insulation work shall be performed by skilled mechanics regularly engaged in the insulation trade.

C. Properly coordinate the insulation work with the other trades so that installation is performed with a minimum of conflict.

D. Insulation shall not be applied on any piping or duct system requiring testing until testing is completed and approved by Owner's Representative.

E. Insulation shall not be applied until all systems are clean, dry, free of dirt, dust or grease.

F. The finished installation shall present a neat and acceptable appearance which includes but is not limited to: all jackets smooth, all vapor barriers sealed properly, no evidence of "ballooning" of the jackets, or sagging insulation, all valves, dampers, gauges, unions, etc. accessible. The Owner's Representative shall be the final judge of acceptance of workmanship.

G. If proper maintenance procedures require access to the insulated equipment removable panels, sections or covers shall be provided to accomplish this. These access devices shall be constructed in a manner to assure easy access and sturdy construction. The contractor shall assume the responsibility to coordinate all equipment requiring insulation to be either factory or field insulated.

H. Insulation and accessories shall be applied only at suitable application temperature and conditions as recommended by the manufacturer. Do not apply insulation to any surface while it is wet.

I. Insulation shall be protected from moisture and weather during storage and installation.

J. Insulation which has sustained moisture damage, torn jackets, or other damage due to improper storage or other reasons shall not be used. If evidence of this is sighted the Owner's representative reserves the right to require the insulating contractor to remove any and/or all insulation until the Owner's Representative is satisfied that there is no longer any inferior insulation installed on this project.

K. Insulation, fabric and jacketing shall be protected from damage during construction. Damage by the insulator shall be repaired without cost to the Owner. Damage by others shall be reported in writing to the contractor.

L. The insulation subcontractor is responsible for proper material storage at the work site.

M. Work performed prior to receipt of approved documents or submittals, later proving to be incorrect or inappropriate, shall be promptly replaced by the contractor without cost to the purchaser.

N. Insulation shall not be installed until adequate access and clearances at control mechanisms, dampers, sleeves, columns and walls have been provided.

O. All insulation at handholes, access doors or other openings, and adjacent to flanges and valves shall be neatly finished where exposed to view.

P. Where an insulated pipe or ductwork passes through a sleeve or opening in a non-rated partition, the full specified thickness of the insulation shall pass through the sleeve or opening. Where an insulated pipe or ductwork passes through a rated partition, the insulation shall be stopped at the partition. The void between the pipe and the sleeve shall be sealed with an approved fire-stopping material, and the insulation trimmed and sealed to the partition sufficient to cover the sleeve.

Q. All materials, accessories and methods of installation and fabrication are subject to the Owner's Representatives inspection and approval during any phase of the work.

R. The insulation subcontractor shall prevent the accumulation of insulation debris in the buildings and on the premises of the Owner.

S. The insulation subcontractor shall be responsible for his own safety program at the work site, and shall provide instruction on safe practices for his workers assigned to the project. All employees are subject to the work rules at the job site.

T. The insulation subcontractor shall familiarize himself with the progress and execution of the job and notify the proper parties of interferences and any problems with the proper installation of his materials.

3.2 INSTALLATION

A. Duct Insulation:

1. General:

a. Insulate or internally line all flexible duct connectors equal to or greater than adjacent insulation thickness.
b. Duct insulation at fire dampers shall be extended over supporting angle iron and sealed to wall.

2. Blanket Fiberglass Insulation:

a. Insulation shall be tightly wrapped on the ductwork with all circumferential joints butted and longitudinal joints lapped 2 inches and stapled. Joints shall be finished with two coats of an approved vapor barrier mastic, reinforced with glass cloth extending 2 inches onto adjacent insulation. One coat of mastic shall be applied to the insulation prior to the application of the glass cloth, which shall be embedded in the mastic to ensure complete adhesion of the cloth. Additionally secure insulation to bottom of rectangular ducts over 24 inches wide with weld pins at no more than 18 inches on center.
b. Insulation shall be butted with facing overlapping all joints shall be finished with two coats of an approved vapor barrier mastic, reinforced with glass cloth extending 2 inches onto adjacent insulation. One coat of mastic shall be applied to the insulation prior to the application of the glass cloth, which shall be embedded in the mastic to ensure complete adhesion of the cloth. Breaks, punctures, pin penetrations in facing shall be sealed with vapor

3.3 MISCELLANEOUS ITEMS

A. General: Provide insulation of any portion of a system or piece of equipment not previously discussed where ambient operating conditions will allow condensation to occur or whose surface temperature exceeds 115°F. Insulation materials and method shall be as directed by the Designer.

B. Final Inspection: At final inspection, the finished surfaces of all exposed insulation shall be clean and without stains or blemishes. Repair and clean the insulation surfaces and, if necessary, to obtain a new appearance, shall coat discolored surfaces with off-white latex water-base semi-gloss paint or lagging adhesive, without a change in the contract price.

END OF SECTION 15250

SECTION 15840
SHOP FABRICATED DUCTWORK

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

B. Provisions of Section 15010, Mechanical General Provisions, shall be made an integral part of this section.

1.2 WORK INCLUDED

A. Galvanized Steel Rectangular Ductwork.

B. Duct Liner.

1.3 QUALITY ASSURANCE

A. All ductwork shall be fabricated within the guidelines established by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) HVAC Duct Construction Standards - Metal and Flexible, latest edition.

B. All ductwork shall be fabricated to withstand the pressure and velocity required on this project.

C. All components, fasteners, sealants, adhesives, etc. in the conditioned air stream or exposed in active or non- active plenums shall conform to the NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems and Standard for Flame/Smoke/Fire Contribution of 25/50/0.

D. All ductwork shall conform to UL standard UL 181 Factory Made Air Duct Materials and Duct Connectors, latest edition. Applicable sections shall apply to shop fabricated ductwork.

E. After fabrication and installation of all shop fabricated ductwork the fabricator and installer, if not the same, shall certify in writing to the Owner's representative that all shop fabricated ductwork and installation of same meets or exceeds the quality standards established by SMACNA.

1.4 SUBMITTALS

A. Submission for acceptance is required.

B. Product data, along with installation operation and maintenance instructions, shall be included in the operation and maintenance manuals.

C. Refer to Section 15010, Mechanical General Provisions for requirements.

1.5 SHOP DRAWINGS

A. Shop Drawings: Provide shop drawings of sheet metal ductwork as follows:

1. Draw to a scale of not less than 1/4 inch to one foot on the same size sheets as the

contract drawings.
2. Show duct sizes.
3. Show fitting details.
4. Show lighting and ceiling diffusers.

B. Floor Plans: Provide sheet metal floor plans drawn to the same scale as the contract drawings.

1. Use contract drawing sheet size.
2. Show on each floor plan the floor penetrations, fire dampers and access doors, ducts with sized and bottom elevations, terminal types and air quantities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized Steel Ductwork:

1. Interior, exposed or concealed: Hot rolled steel continuously annealed and hot dipped galvanized sheet or coil, minimum G-90, 0.90 oz/sf coating suitable for forming without flaking or peeling, suitable for welding or soldering. Zinc coating shall not be impaired from double seaming, breaking or roll forming. 14 ga. and lighter conforming to ASTM A 653. 13 ga and heavier conforming to ASTM A 653.
2. Exterior or Areas Requiring Painting: Hot rolled steel continuously annealed and hot dipped galvanized sheet or coil, minimum G-90, 0.90 oz/sf (.001 inch thick/side) coating with a mill applied phosphate film suitable for insulating the paint from the drying action of the zinc, capable of forming without flaking or peeling, suitable for welding or soldering. Zinc coating shall not be impaired from double seaming, breaking or roll forming. 14 ga. and lighter conforming to ASTM A 653. 13 ga. and heavier conforming to ASTM A 653.

B. Duct Liner: Flexible Duct Liner: Flexible fibrous glass bonded with a thermosetting resin, air stream surface is faced with a black erosion proof coating with an EPA registered anti-microbial agent, minimum density of 2.0 lb/cf for 1/2” thickness and 1.5 lb/cf for 1", 1-1/2" and 2" thickness, maximum conductivity per 1" thickness of .28 at 75°F mean temperature, rated for air temperatures to 250°F and velocities up to 5000 FPM. Liner shall conform to North American Insulation Manufacturers Association (NAIMA) Fibrous Glass Duct Liner Standard. Based on Certainteed ToughGard Duct Liner.

C. Duct Liner Adhesive. Conform to Adhesive Sealant Council (ACS) ACS-A-7001 and ASTM C916.

D. Duct Sealants: Provide sealants with a maximum 25 flame spread, and maximum 50 smoke in the dry state, conforming to ASTM E 84, "Standard Test Method for Surface Burning Characteristics of Building Materials", and fire resistive and non-flammable in accordance with ASTM D 93, "Standard Test Methods for Flash Point" by "Pensky-Martens Closed Tester", when wet.

2.2 FABRICATION

A. Galvanized Steel Ductwork:

1. Fabricate ductwork as indicated on the drawings. Sizes given are inside clear dimensions. Allowances must be made for duct liner if indicated. Unless otherwise indicated on the drawings, the metal gauge shall be in accordance with

SMACNA-HVAC Duct Construction Standards - Metal and Flexible, Latest Edition.

2. Elbow Fabrication:

   a. 90 deg. elbows 12" or less in width shall be radiused whenever possible.
   b. All radiused elbows shall be full radiused (R=1.5).
   c. All mitered 90 deg. elbows shall have turning vanes. Ducts with a width/depth ratio of 1 or more shall have double thickness turning vanes; single thickness is permissible for less than 1.

3. Tee or Take-off Fabrication:

   a. Take-off to round run-outs shall be conical or bell mouth. Where conical or bellmouth fittings can not be used due to take-off size to main, provide factory fabricated side takeoff fitting equal to Flexmaster U.S.A., Inc. Type “STO”. Provide with handle extension for insulated ducts to clear the insulation thickness specified.
   b. Take-off to square or rectangular shall be 45 deg. clinch collar or proportional divisions.
   c. A volume damper shall be located downstream of each take off on square and rectangular take-offs, and integral to round run-outs.

4. Transitions:

   a. Concentric Transition: Maximum angle 45 deg. diverging, 60 deg. converging (SMACNA Fig. 2-7).
   b. Eccentric Transition: Maximum angle 30 deg. diverging or converging (SMACNA Fig. 2-7).

5. At the Contractor’s option, ductwork may be joined at the transverse joints with prefabricated galvanized Ductmate Industries, Inc. (”25" or “35") or Ward Industries, Inc. sections, or with fabricated TDF or TDC T-24 type flanged transverse joints with bolted corners, gaskets, and sealants, constructed in accordance with the SMACNA HVAC Duct Construction Standards - Metal and Flexible, latest edition, Table 1-12. Ductmate “25" may be used only on ductwork with a pressure classification of 2" w.g. or less on the discharge side of air handling units or fan power terminal units. Plastic joint clips are not acceptable. Flanged and prefabricated joints by different manufacturers shall not be jointed. Formed on flanges shall not be used.

B. Ductwork, General: Each duct section shall have both ends covered with polyethylene or other suitable material to protect against the entrance of dirt, debris or water during shipment and storage prior to installation.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Install in strict accordance with the Sheet Metal and Air Conditioning Contractor's National Association, Inc.'s (SMACNA) recommendations.

B. The drawings, due to their small scale, are diagrammatic in nature and are not necessarily complete in all details. For this reason not all necessary offsets, risers or falls are shown. Coordinate the installation of the ductwork with all other trades and to provide all necessary offsets, etc. as required for completion of this project without any additional cost to the Owner, Architect and/or Engineer.

C. All ductwork shall be run parallel or perpendicular to building structure whenever possible.

D. All ductwork shall be properly sealed.

E. Coordinate the location, provide the necessary access and install all devices provided in other specification sections within Division 15. Including but not limited to fire, smoke and/or balancing dampers, access and mounting for control devices, air flow measuring stations, etc. as apply to this project.

F. All ducts passing through partitions or walls shall pass through at a 90 degree angle. The duct shall be sleeved with the space between the sleeve and duct properly sealed with firestopping material (Refer to Division 7 for Firestopping materials). The sleeve shall be permanently affixed to the wall (see Section 15090: Supports, Hangers, Anchors and Sleeves for sleeve specifications).

G. Coordinate the proper duct pressure classification with the systems served and to construct the ductwork to withstand these pressures. (See 3.6 Schedules; System Pressure Classification and Duct Material Schedules.)

3.2 CLEANING AND PROTECTION

A. During construction, ductwork shall be cleaned of dirt and debris internally section by section as it is installed. At end of each day, ductwork not finally connected to equipment shall be provided with a temporary closure of polyethylene film or other covering material that will prevent entrance of duct, debris or water. Clean exterior surfaces of any material which might cause corrosion or if the duct is to be painted, it shall be cleaned suitable for painting. After substantial completion of the ductwork system, the system shall be operated with filters in place to blow-out any remaining dust from the system. Protect all equipment and property from damage or fouling during this cleaning. All prefilters used during cleaning shall be replaced prior to turning the system over to the Owner.

3.3 DUCT SEALING REQUIREMENTS

A. All ducts shall have SMACNA Seal Class A (all transverse joints, longitudinal seams and duct wall penetrations).

3.5 INSTALLATION

A. Galvanized Steel Ductwork:

1. Install ductwork as indicated on the drawings. If any conflict occurs notify the Owner's Representative prior to any extensive rerouting.
2. Install ductwork to allow clearance for the installation of duct insulation.
3. Provide duct liner as specified and/or detailed. (See 3.6 Schedule for liner requirements.)

B. Duct Liner:

1. Coordinate the proper duct liner thickness with the liner thickness schedule included in Para. 3.6 - Schedules.
2. The liner shall be applied with fire resistant adhesive and weld pin mechanical fasteners on a maximum of 15" centers for velocities less than 1500 FPM and 12" centers for velocities above 1501 FPM. Adhered or clinched pinched type pins not permitted. When installed, fastener heads shall not compress the insulation more than 1/8” based on the nominal insulation thickness.

3. The liner shall be butted and sealed at all joints, seams and exposed edges to ensure continuous thermal resistance, and condensation control. In unconditioned, non-accessible areas such as chases and dry wall ceilings, the lined duct shall also have an additional layer of duct wrap at the joints for a minimum of 6" either side of the joint to assure condensation control.

3.6 SCHEDULES

A. Ductwork shown to be round or oval is to be provided under Section 15846 - Pre-Fabricated Ductwork.

B. System Pressure Classification and Duct Material Schedule for Shop Fabricated Ductwork:

	System	Section	Maximum Pressure	Duct Material
3.	Supply To Terminal	A.C Unit	3" pos.	A
4.	Supply	Terminal to Diffuser	1" pos.	A
5.	Supply	AHU to grille	3 pos.	A
6.	Return	Inlet Grille to Terminal	2" neg.	A
7.	Return	All AHU Return	1" neg.	A
8.	Air Transfer Duct	All	2" neg.	A

Schedule Legend:

Duct Material

A Galvanized Steel

END OF SECTION 15840

SECTION 15846
PRE-FABRICATED DUCTWORK

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

B. Provisions of Section 15010, Mechanical General Provisions, shall be made an integral part of this section.

1.2 WORK INCLUDED

A. Single Wall Round or Flat Oval Galvanized Steel Ductwork and Fittings.

B. Single Wall Round Snaplock Seam Galvanized Steel Ductwork and Fittings.

1.3 QUALITY ASSURANCE

A. All ductwork shall be fabricated within the guidelines established by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) HVAC Duct Construction Standards - Metal and Flexible, latest edition.

B. All ductwork shall be fabricated to withstand the pressure and velocity required on this project.

C. All components, fasteners, sealants, adhesives, etc. in the conditioned air stream or exposed in active or non- active plenums shall conform to the NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems and Standard for Flame/Smoke/Fire Contribution of 25/50/0.

D. All ductwork shall conform to UL standard UL 181 Factory Made Air Duct Materials and Duct Connectors, latest edition. Applicable sections shall apply to shop fabricated ductwork.

E. After fabrication and installation of all shop fabricated ductwork the fabricator and installer, if not the same, shall certify in writing to the Owner's representative that all shop fabricated ductwork and installation of same meets or exceeds the quality standards established by SMACNA.

1.4 SUBMITTALS

A. Submission for acceptance is required.

B. Product data, along with installation operation and maintenance instructions, shall be included in the operation and maintenance manuals.

C. Refer to Section 15010, Mechanical General Provisions for requirements.

1.5 SHOP DRAWINGS

A. Shop Drawings: Provide shop drawings of ductwork as follows:

1. Draw to a scale of not less than 1/4 inch to one foot on the same size sheets as

the contract drawings.
2. Show duct sizes.
3. Show fitting details.
4. Show lighting and ceiling diffusers.

B. Floor Plans: Provide sheet metal floor plans drawn to the same scale as the contract drawings.

1. Use contract drawing sheet size.
2. Show on each floor plan the floor penetrations, fire dampers and access doors, ducts with sizes and bottom elevations, terminal types and air quantities.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Single Wall Round or Flat Oval Galvanized Steel Ductwork and Fittings:

1. Autoduct, Inc.
2. Eastern Sheet Metal
3. Hamlin Sheetmetal, Inc.
4. Impulse Air.
5. Lindab
6. Semco Manufacturing, Inc.
7. United McGill

B. Single Wall Round Snaplock Seam Galvanized Steel Ductwork and Fittings:

1. Alco Manufacturing Company.
2. Crown Products Company.
3. Hughes.

2.2 FABRICATION

A. Single Wall Round Ductwork and Fittings:

1. Materials: Hot rolled, continuously annealed, hot dipped galvanized steel minimum of G-90, 0.90 oz/sf coating, conforms to ASTM A653.
2. Metal Gauges: Conform to the Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA) HVAC Duct Construction Standards - Metal and Flexible, latest edition. The following table shall establish a minimum guideline unless the manufacturer has U.L. Standard 181 test results that show that lighter gages (thinner wall thickness) with intermediate corrugations (ribs) allow the gage reduction:

Pipe Diameter	Positive Internal Static Pressure in W.G.					
	0" - 2.0" Spiral		2.1" - 4.0" Spiral		4.1" - 10.0" Spiral	
	Pipe	Fittings	Pipe	Fittings	Pipe	Fittings
6" - 10"	28	26	28	24	28	24
12"	28	26	28	24	26	24
14"	28	26	26	24	26	24
16"	26	24	26	22	24	22

18" - 26"	26	24	24	22	24	22
27" - 36"	24	22	22	20	22	20
37" - 50"	22	20	20	20	20	20
51" - 60"	20	18	18	18	18	18
61" - 84"	18	16	18	16	18	16

3. Duct Construction: Spiral wound, lockseam construction, slip joint or flanged connections as noted below under couplings.
4. Fitting Construction:

   a. 90 Deg. and 45 Deg. Ells: Solid - welded seam construction for dust collector use, Solid - welded seam or spot welded and bonded for general use. Radiused ells to be full radiused unless otherwise noted, mitered ells to have single thickness, turning vanes, slip joint or flanged connections.
   b. Tees or Crosses: Solid - welded seam construction for dust collector use, Solid - welded seam or spot welded and bonded for general use. Tangential, unless otherwise noted or detailed, conical take off or reduction, slip joint or coupled ends. 180 Deg. or 45 Deg. as indicated.
   c. Bellmouth: Solid - welded seam construction for dust collector use, Solid - welded seam or spot welded and bonded for general use. Spun metal, smooth converging bellmouth, round, gauge equal or greater than connecting duct.
   d. Access Section:

      1) 7" Diameter and Less: Minimum 12" long flanged section, minimum four bolts per flange.
      2) 8" Diameter and Larger: Round or rectangular access cover, on welded raised section, pressure sensitive release suitable for manual release or emergency vacuum release, chain retainer, (see Para. 3.5: Schedules for Sizes).

   e. Couplings:

      1) Joints 36" or less shall have 2" slip coupling.
      2) 38" or over shall be spiral mate or oval mate.

   f. Based on United McGill

B. Single Wall Round Snaplock Seam Galvanized Steel Ductwork and Fittings:

1. Materials: Hot rolled, continuously annealed, hot dipped galvanized steel minimum of G-90, 0.90 oz/sf coating, conforms to ASTM A653.
2. Metal Gauges: Minimum of 26 gauge, with remaining sizes conforming to the Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA) HVAC Duct Construction Standards Metal and Flexible, latest edition. The following table shall establish a minimum guideline:

   Round Ducts:

Duct Diameter	Spiral Pipe	Fittings and Longitudinal Seam Pipe
3" thru 14"	26	24
15" thru 26"	24	22
27" thru 30"	22	20

3. Duct Construction: Snaplock seam construction, slip joint or flanged connections.
4. Fitting Construction:

   a. 90 Deg. and 45 Deg. Ells: Adjustable ells to be full radiused unless otherwise noted, slip joint or flanged connections.
   b. Tees or Crosses: Adjustable, unless otherwise noted or detailed, conical take off or reduction, slip joint or coupled ends. 180 Deg. or 45 Deg. as indicated.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS:

A. Install in strict accordance with the manufacturer's written installation instructions.

B. The drawings, due to their small scale, are diagrammatic in nature and are not necessarily complete in all details. For this reason not all necessary offsets, rises or falls are shown. Coordinate the installation of the ductwork with all other trades and to provide all necessary offsets, etc. as required for completion of this project without any additional cost to the Owner, Architect or Engineer.

C. All ductwork shall be run parallel or perpendicular to building structure and seams or spirals shall be aligned whenever possible.

D. All sizes indicated on the drawings are inside clear dimensions.

E. All ductwork shall be properly sealed in a neat clean manner with all excess sealer wiped clean.

F. Coordinate the location of, provide the necessary access and install all devices provided in other specification sections within Division 15, including but not limited to fire, smoke and/or balancing dampers, access and mounting for control devices, air flow measuring stations, etc., as apply to this project.

G. All ducts passing through partitions or walls shall be properly and neatly sealed. If partition or wall carries a fire rating (fire damper indicated or if architectural plans indicate a rated wall) the duct shall be sleeved with the space between the sleeve and duct properly sealed with firestopping material (Refer to Section 15050 and/or Division 7 for firestopping requirements). The sleeve shall be permanently affixed to the wall (see Section 15090: Supports, Hangers, Anchors and Sleeves for sleeve specification).

H. Coordinate the proper duct pressure classification with the system served and to provide the proper ductwork to withstand these pressures. (See Para. 3.5 Schedules: System Pressure Classification and Duct Material Schedule.)

3.2 CLEANING AND PROTECTION

A. During construction, ductwork shall be cleaned of dirt and debris internally section by section as it is installed. At end of each day, ductwork not finally connected to equipment shall be provided with a temporary closure of polyethylene film or other covering material that will prevent entrance of dust, debris or water. Clean exterior surfaces of any material which might cause corrosion or if the duct is to be painted, it shall be cleaned suitable for painting. After substantial completion of the ductwork system the system shall be operated with filters in place to blow-out any remaining dust from the system. Protect all equipment and property from damage or fouling during this cleaning. All prefilters used during cleaning shall be replaced prior to turning the system over to the Owner.

B. During field investigations, if the Owner or Engineer inspect ductwork and find dust, debris, water or any other contaminant the contractor will be responsible for cleaning or replacing, at the discretion of the Owner and Engineer, the ductwork section at the contractor's expense.

3.4 INSTALLATION

A. General:

1. Install generally as indicated.
2. Conceal ductwork in finished spaces unless indicated otherwise.
3. Do not install ductwork in or allow to enter or pass through electrical rooms, elevator machine room, or spaces housing switchboards, panelboards or distribution boards, except ductwork that serves electrical rooms, elevator machine rooms or spaces.
4. Exercise special care to provide tight fitting well fabricated, well braced ductwork systems.
5. Field assemble rectangular, round or flat oval ductwork as follows:

   a. Use slip joints, couplings, etc. sealed with adhesive pre-applied to couplings or duct mate spiralmate or oval mate on duct sizes 1" and larger.
   b. Isolate dissimilar metals with elastomeric sealant tape or fiber gaskets and gaskets and washers for bolts.

6. In high pressure ductwork (above 2" w.g.), do not use 2 piece mitered 90 degree elbows with or without vanes unless approved by engineer.
7. Make duct connections from hoods, openings, fans and other devices.

3.5 SCHEDULES

A. System Pressure Classification and Duct Material Schedule:

System I.D. #	System	Section	Maximum Pressure	Duct Material
1.	Supply	AHU to Terminal	3" pos.	A
2.	Supply	Terminal to Diffuser	1" pos.	A
3.	Return	Terminal to AHU	2" neg.	A

Schedule Legend:

Duct Material

A Galvanized Steel

B. Access Door Schedule:

1. Round Duct:

	Duct Size	Access Door Size
a.	up to 7" dia.	12" long removable section
b.	8" to 12" dia.	8" x 12"
c.	13" to 18" dia.	12" x 12"
d.	19" dia. and up	14" x 20"

END OF SECTION 15846

SECTION 15860
SHEET METAL SPECIALTIES

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

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

B. Provisions of Section 15010, Mechanical General Provisions, shall be made an integral part of this section.

1.2 WORK INCLUDED

A. Duct access doors.

B. Smoke/Fire dampers.

C. Hardware cloth.

1.3 QUALITY ASSURANCE

A. All products provided for enhancement of Life Safety shall be UL listed and bear the appropriate label stating compliance.

B. All products located in the conditioned air stream or located in return air plenums shall conform to the NFPA 90A Flame/Smoke/Fuel Contribution of 25/50/0 and all other applicable requirements of NFPA 90A.

C. Smoke and Smoke/Fire dampers shall be provided with a 60 month from the date of shipment parts only warranty, including freight for all components, including damper operators.

D. Provide Florida Product Approval Numbers for all Products required by the Florida Building Code.

1.4 SUBMITTALS

A. Submission for acceptance is required.

B. Product data, along with installation operation and maintenance instructions, shall be included in the operation and maintenance manuals.

C. Refer to Section 15010, Mechanical General Provisions for requirements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Duct Access Doors:

1. Air Balance, Inc.
2. Cesco Products
3. Greenheck, Inc.
4. Nailor Industries, Inc.

5. Nystrom
6. Prefco Products, Inc.
7. Ruskin Manufacturing, Co.
8. Safe Air Inc.

B. Smoke/Fire Dampers:

1. Air Balance, Inc.
2. Cesco Products
3. Greenheck, Inc.
4. Nailor Industries, Inc.
5. Prefco Products, Inc.
6. Ruskin Manufacturing, Co.
7. Safe Air Inc./Dowco

C. Hardware Cloth:

1. McNichols Co.
2. Owner Approved Equal.

2.2 FABRICATION

A. Duct Access Doors:

1. Low Pressure Ductwork:

a. Rating up to 2" wg positive or negative.
b. Frame: Minimum 22 gauge galvanized steel or aluminum, minimum 5/8" knock over edge, neoprene gasket between frame and duct and frame and door.
c. Door: Minimum 24 gauge galvanized steel or aluminum, continuous hinge and cam latches or minimum 2 cam latches, double wall construction, fiberglass insulated thickness to match ductwork.
d. Based on Ruskin Manufacturing Co. ADH24.

2. High Pressure Ductwork:

a. Rating: Up to 10" wg positive pressure.
b. Frame: Minimum 16 gauge galvanized steel with "Z" shaped reinforced corners, polyurethane gasket between frame and duct and frame and door.
c. Door: Minimum 16 gauge galvanized steel or aluminum, minimum 2 spring latches, double wall construction, fiberglass insulated with thickness to match ductwork.
d. Based on Ruskin Manufacturing Co. ADHP-3.

B. Smoke/Fire Dampers:

1. Low and Medium Pressure Ductwork:

a. UL labeled under the following standards:

1) UL 555 - 1-1/2 hr. fire endurance.
2) UL 555S - Low leakage rated, no more than 10 CFM/SF @ 1" w.g. (UL Class II) after exposure to 1000°F for 1 hour (non-degradable).
3) Classified for both horizontal and vertical mounting.

b. Construction: Single damper designed and rated for combination smoke/fire duty.

1) Frame: 16 ga. galvanized steel.
2) Damper Blades: 14 gauge true airfoil design constructed of galvanized steel of low leakage non-heat degradable design with friction free inflatable silicone coated fiberglass material to maintain smoke leakage rating to a minimum of 450°F and galvanized steel for flame seal to 1900°F. Blade shall be suitable for installation in systems with a maximum velocity of 2,000 FPM and 4" w.g. pressure at closure.
3) Duct sleeve provided by others.

c. Operation:

1) Smoke/fire damper operation by means of an integral resettable and re-useable UL listed electric-ambient temperature link, UL listed releasing device and mechanical lock assembly. Link activated by either electric, 120V AC or 24V AC signal from smoke detector alarm circuit or 350°F duct ambient temperature. Damper shall be capable of being reopened by remote signal when the duct temperature drops to 150°F. Electric motor actuator shall be UL listed with the damper assembly for power open/spring closed operation. Motor actuator shall be factory furnished with all connecting linkage and mounting hardware and shall be factory tested for proper operation.
2) Damper and actuator shall be provided with a 60 month warranty as described in Paragraph 1.3.C.

d. Based on Ruskin Manufacturing, Co., FSD60-2.

C. Hardware Cloth: 4 mesh galvanized steel, plain weave with .035 wire.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Install all products in strict accordance with the manufacturer's written installation instructions.

B. Coordinate the installation of products provided within other sections of Division 15 including but not limited to control dampers, air flow measuring stations, etc.

3.2 INSTALLATION

A. Duct Access Doors:

1. Coordinate the proper class access door with the system requirements.
2. Duct access doors shall be mounted so as to allow maximum access and/or door swing while also providing easy access from the floor or other personal accessible structures.
3. Duct access doors shall be provided wherever required for proper maintenance of equipment, access to duct mounted control devices, or visual inspection and setting of dampers, etc. All doors, due to the small scale of the drawings, may not be shown, it is the contractor's responsibility to coordinate with all trades concerned to provide the necessary quantity and properly locate all doors.

B. Smoke/Fire Damper:

1. Provided where indicated. All smoke dampers in fire rated barriers to be combination type.
2. Review the architectural drawings to determine the wall construction rating so as to provide the proper rated damper.
3. All smoke/fire dampers shall be mounted within a UL approved thickness galvanized steel sleeve permanently affixed to the wall by means of perimeter retaining angles.
4. The smoke/fire damper shall be permanently attached to the sleeve. All voids around the sleeve and damper and sleeve and wall shall be properly sealed with fire barrier material.
5. Ductwork shall be attached to the smoke/fire damper by means of a UL approved break away connection.
6. Access doors or access sections shall be provided at all smoke/fire damper locations.
7. Coordinate the provision of the smoke damper actuator with the Building Control System and assure adequate space for the mounting of the actuator during installation of the smoke/fire damper and ductwork.

C. Hardware Cloth: Install over all open ended ducts. Provide sheetmetal pocket over raw edges and secure with sheetmetal screws through the metal edge cover.

3.3 SCHEDULES

A. Access Door Schedule:

1. Square or Rectangular Duct work:

Access Door Mounting

	Surface Max. Dim.	Access Door Size
1.	6"	12" long Remov. Section
2.	7" to 8"	6" x 6"
3.	9" to 12"	8" x 8"
4.	13" to 18"	12" x 12"
5.	19" and up	16" x 16"

END OF SECTION 15860

SECTION 15870
GRILLES, REGISTERS AND DIFFUSERS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

B. Provisions of Section 15010, Mechanical General Provisions, shall be made an integral part of this section.

1.2 WORK INCLUDED

A. Grilles.

B. Registers.

C. Diffusers.

1.3 QUALITY ASSURANCE

A. Manufacturer shall certify cataloged performance and ensure correct application of all air outlet types.

B. All components within the conditioned air stream or exposed in active or non-active plenums shall conform to the NFPA 90A standard for Flame/Smoke/Fire Contribution of 25/50/0.

1.4 SUBMITTALS

A. Submit schedule and product data for acceptance. Coordinate submittal by "G" number and include construction details, capacity ratings including air side pressure drops and NC levels.

B. Product data, along with installation operation and maintenance instructions, shall be included in the operation and maintenance manuals.

C. Refer to Section 15010, Mechanical General Provisions for requirements.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Grilles:

1. Anemostat
2. Krueger
3. Metal Aire Division of Metal Industries, Inc.
4. Nailor
5. Price
6. Titus
7. Trox

B. Registers:

2. Anemostat
3. Krueger
4. Metal Aire Division of Metal Industries, Inc.
5. Nailor
6. Price
7. Titus
8. Trox

C. Diffusers:

1. Anemostat
2. Krueger
3. Metal Aire Division of Metal Industries, Inc.
4. Nailor
5. Price
6. Titus
7. Trox

2.2 FABRICATION

A. Fixture designations as shown on the drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. Install all devices in strict accordance with the manufacturer's written installation instructions.

B. Coordinate the proper grille style and frame style with the final approved ceiling construction and install grilles, registers and diffusers in accordance with the requirements of the architectural reflected ceiling plan.

C. Due to the small scale of the drawings the contractor shall assume the responsibility to coordinate the air outlet and inlet locations with the reflected ceiling plans, lighting plans, sections and or details.

D. Any unlined or otherwise exposed parts beyond the grille, register or diffuser face exposed to sight shall be painted black.

E. Coordinate the color requirements for all grilles, registers and diffusers with the Owner's Representative.

F. Insulate the back pans of all diffusers per the requirements of Specification Section 15250.

G. Air distribution devices installed in lay-in ceilings shall have a 24”x24” extended panel.

H. Devices installed in sheetrock or other hard ceilings shall be surface mount type.

END OF SECTION 15870

SECTION 16010
BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes Basic Electrical Requirements specifically applicable to Division 16 Sections, in addition to Division 1 - General Requirements - and any supplemental requirements/conditions.

1.3 DESCRIPTION OF WORK

A. The work required under this Division shall include all materials, labor and auxiliaries required to install a complete and properly operating electrical system.

B. The Contractor shall furnish, perform, or provide all labor including planning, purchasing, transporting, storing, installing, testing, cutting and patching, trenching, excavating, backfilling, coordination, field verification, equipment (installation and safety), supplies, and materials necessary for the correct installation of complete electrical systems (as described or implied by these specifications and the applicable drawings) in strict accordance with applicable codes, which may not be repeated in these specifications, but are expected to be common knowledge of qualified Bidders.

C. The Division 16 Contract Documents refer to work required in addition to (or above) the minimum requirements of the NEC and applicable local codes. All work shall comply with all applicable codes as a minimum and with the additional requirements called for in these Contract Documents.

D. Only trained, and licensed personnel shall be used by the Contractor to perform work. The Contractor shall not perform work, which violates applicable Codes, even if called for in the Contract Documents. The Contractor's Bid shall include work necessary to completely install the electrical systems indicated by the Contract Documents in accordance with applicable Codes.

E. Refer to other Division 16 Sections for additional work requirements.

F. Connections of all items using electric power shall be included under this division of the specifications, including necessary wire, conduit, circuit protection, disconnects and accessories. Securing of roughing-in drawings and connection information for equipment involved shall also be included under this division. See other divisions for specifications for electrically operated equipment.

G. The Contractor shall provide and install panic hardware on all electrical room doors where the electrical room houses equipment rated 1200 amps or more per NEC 110.26. All electrical room doors shall open in the direction of egress.

1.4 WORK SEQUENCE

A. Install work in stages and/or phases to accommodate Owner's occupancy requirements. Coordinate electrical schedule and operations with Owner and Architect/Engineer.

1.5 CODES, FEES, AND STANDARDS

A. Conform to all applicable requirements of Section Reference Standards and Regulatory Requirements.

B. Obtain permits and request inspections from authority having jurisdiction and applicable utility

companies.

C. Pay for all required licenses, fees, and inspections.

D. Material shall be new and free of defects with UL listing or be listed with an approved, nationally recognized Electrical Testing Agency if and only if UL Listing is not available for material.

1.6 PROJECT/SITE CONDITIONS

A. Install Work in locations shown or described in the Contract Documents, unless prevented by Project conditions.

B. The Contractor shall install all equipment so that all Code required and Manufacturer recommended servicing clearances are maintained. Contractor shall be responsible for the proper arrangement and installation of all equipment within any designated space. Should the Contractor determine that a departure from the Contract Documents is necessary, he shall submit to the A/E, for approval, detailed drawings of his proposed changes with his written reasons for the changes. No changes shall be implemented by the Contractor without the issuance of the required drawings, clarifications, and/or change orders.

C. The Contractor shall verify finish dimensions at the project site in preference to using dimensions noted on Contract Documents.

1.7 INVESTIGATION OF SITE

A. Check site and existing conditions thoroughly before bidding. Advise A/E of discrepancies or questions noted.

B. Each Bidder shall visit the site and shall thoroughly familiarize himself with existing field conditions and the proposed work as described or implied by the Contract Documents. During the course of the site visit, the electrical bidder shall verify every aspect of the proposed work and the existing field conditions in the areas of construction and demolition which will affect his work. The Contractor will receive no compensation or reimbursement for additional expenses he incurs due to failure to make a thorough investigation of the existing facilities. This shall include rerouting around existing obstructions.

C. Submission of a proposal will be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered will not be recognized.

D. Existing conditions and utilities indicated are taken from existing construction documents, surveys, and field investigations. Unforeseen conditions probably exist and existing conditions shown on drawings may differ from the actual existing installation with the result being that new work may not be field located exactly as shown on the drawings. Contractor shall field verify dimensions of all site utilities, conduit routing, boxes, etc., prior to bidding and include any deviations in the contract. Notify A/E if deviations are found.

E. All existing electrical is not shown. The Contractor shall become familiar with all existing conditions prior to bidding, and include in his bid the removal of all electrical equipment, wire, conduit, devices, fixtures, etc. that is not being reused, back to its originating point.

F. The Contractor shall locate all existing utilities and protect them from damage. The Contractor shall pay for repair or replacement of utilities or other property damaged by operations in conjunction with the completion of this work.

G. Remove existing power, lighting, systems, material and equipment which are made obsolete or which interfere with the construction of the project. Reinstall power, lighting, systems, materials and equipment which are required to remain active for the facility to be fully functional.

H. All items removed and not re-used shall be immediately turned over to Owner as they are made available by renovation. Remove items from job site and deliver to Owner's storage location(s)

as directed by project manager. Discard complete items which Owner elects to refuse.

I. Investigate site thoroughly and reroute all conduit and wiring in area of construction in order to maintain continuity of existing circuitry. Existing conduits indicated in Contract Documents indicate approximate locations only. Contractor shall verify and coordinate existing site conduits and pipes prior to any excavation on site. Bids shall include hand digging and all required rerouting in areas of existing conduits or pipes.

J. Work is in connection with existing buildings which must remain in operation while work is being performed. Work shall be in accord with the schedule required by the Contract. Schedule work for a minimum outage to Owner. Notify Owner 24 hours in advance of any shut-down of existing systems. Perform work during non-general office operating hours unless otherwise accepted by Owner. Protect existing buildings and equipment during construction.

K. Bid shall include all removal and relocation of all piping, fixtures or other items required for completion of alterations and new construction.

L. See 16060 for additional requirements due to existing conditions.

1.8 CONTRACT DOCUMENTS

A. These specifications and applicable drawings shall be considered supplementary, one to the other and are considered Contract Documents. All workmanship, methods, and/or material described or implied by one and not described or implied by the other shall be furnished, performed, or otherwise provided just as if it had appeared in both sets of documents.

B. Where a discrepancy or conflict is found between these specifications and any applicable drawing, the Contractor shall notify the A/E in written form. In the event that a discrepancy exists between specifications and any applicable drawing, the most stringent requirement shall govern unless the discrepancy conflicts with applicable codes wherein the code shall govern. The most stringent requirement shall be that work, product, etc which is the most expensive and costly to implement.

C. The drawings are diagrammatic and are not intended to include every detail of construction, materials, methods, and equipment. They indicate the result to be achieved by an assemblage of various systems. Coordinate equipment locations with Architectural and Structural drawings. Layout equipment before installation so that all trades may install equipment in spaces available. Coordinate installation in a neat and workmanlike manner.

D. Wiring arrangements for equipment shown on the drawings are intended to be diagrammatic and do not show all required conductors and functional connections. All wiring and appurtenances required for the proper operation of all equipment to be connected shall be provided.

E. Specifications require the Contractor to provide shop drawings which shall indicate the fabrication, assembly, installation, and erection of a particular system's components. Drawings that are part of the Contract Documents shall not be considered a substitute for required shop drawings, field installation drawings, Code requirements, or applicable standards.

F. Locations indicated for outlets, switches, and equipment are approximate and shall be verified by instructions in specifications and notes on the drawings. Where instructions or notes are insufficient to locate the item, notify the A/E.

G. The Contractor shall take finish dimensions at the project site in preference to scaling dimensions on the drawings.

H. Where the requirements of another Division, section, or part of these specifications exceed the requirements of this Division those requirements shall govern.

1.9 MATERIALS AND EQUIPMENT

A. Material shall be new (except where specifically noted, shown or specified as "Reused") and/or

denoted as existing) and shall be UL listed and bear UL label. Where no UL label listing is available for a particular product, material shall be listed with an approved, nationally recognized Electrical Testing Agency. Where no labeling or listing service is available for certain types of equipment, test data shall be submitted to prove to the Engineer that equipment meets or exceeds available standards.

B. Where Contract Documents list design selection or manufacturer, type, this model shall set the standard of quality and performance required. Where no brand name is specified, the source and quality shall be subject to A/E's review and acceptance. Where Contract Documents list accepted substitutions, these items shall comply with Section 16013 and requirements in this Division of the Specifications for substitutions.

C. When a product is specified to be in accordance with a trade association or government standard and at the request of A/E the Contractor shall furnish a certificate that the product complies with the referenced standard and supporting test data to substantiate compliance.

D. Where multiple items of the same equipment or materials are required, they shall be the product of a single Manufacturer.

E. Where the Contract Documents require materials and/or equipment installed, pulled, or otherwise worked on, the materials and/or equipment shall be furnished and installed by the Contractor responsible for Division 16 methods and materials unless specifically noted otherwise.

F. Where the contract documents refer to the terms "furnish," "install," or "provide," or any combination of these terms) the materials and/or equipment shall be supplied and delivered to the project including all labor, unloading, unpacking, assembly, erection, anchoring, protecting supplies and materials necessary for the correct installation of complete system unless specifically noted otherwise.

G. Before the Contractor orders equipment, the physical size of specified equipment shall be checked to fit spaces allotted on the drawings, with NEC working clearances provided. Internal access for proposed equipment substitutions shall be provided.

H. Electrical equipment shall be protected from the weather during shipment, storage, and construction per manufacturer's recommendations for storage and protection. Should any apparatus be subjected to possible damage by water, it shall be thoroughly dried and put through a dielectric test, at the expense of the Contractor, to ascertain the suitability of the apparatus, or it shall be replaced without additional cost to the Owner. No additional time will be allowed and the project completion date shall be maintained.

I. Inspect all electrical equipment and materials prior to installation. Damaged equipment and materials shall not be installed or placed in service. Replace or repair and test damaged equipment in compliance with industry standards at no additional cost to the Owner. Equipment required for the test shall be provided by the Contractor with no additional cost to the Contract.

J. Material and equipment shall be provided complete and shall function up to the specified capacity/function. Should any material and/or equipment as a part or as a whole fail to meet performance requirements, replacements shall be made to bring performance up to specified requirements. Damages to finish by such replacements, alterations, or repairs shall be restored to prior conditions, at no additional cost to the Owner.

K. Where tamperproof screws are specified or required, Phillips head or Allen head devices shall not be accepted. For each type used, provide Owner with three tools. Owner will designate the specific hardware design to correspond with existing devices elsewhere in the building, to limit special tool requirements.

L. Where the Contract Documents denote equipment and/or material to be 'new' and/or 'existing' and also provide no denotation for other equipment as to it being 'new' and/or 'existing,' this is not to infer that the non-denoted equipment is either new or existing, or opposite of the equipment

that is denoted. The use of the terms 'new' or 'existing' is meant to clarify denoted equipment/materials for that item only, and the lack of the terms 'new' or 'existing' in relation to identifiers/notes/denotations on the drawings is not to infer that this non-denoted equipment or materials is new or existing.

1.10 MISCELLANEOUS CIRCUITS REQUIRED

A. Provide 120 volt, 20 amp circuit to all fire alarm panels, remote panels, etc (whether shown on drawings or not). Connect to spare 20 amp, 1 pole circuit breaker in nearest 120 volt panel. Re-label circuit breaker accordingly. Provide locking device on breaker. Coordinate location with fire alarm system engineer (and drawings/specifications) prior to bid and provide all electrical. Coordinate final location and electrical requirements with panel installer after bid and provide all electrical. Nearest panel to be nearest emergency panel, when building has emergency generator system.

B. Provide 120 volt, 20 amp circuit to fire and smoke dampers (whether shown on drawings or not). Connect to spare 20 amp, 1 pole circuit breaker in nearest 120 volt panel. Re-label circuit breaker accordingly. Provide locking device on breaker. Coordinate location with fire protection engineer (and drawings/specifications) prior to bid and provide all electrical. Coordinate final location and electrical requirements with damper installer after bid and provide all electrical. Nearest panel to be nearest emergency panel, when building has emergency generator system.

C. Provide 120 volt, 20 amp circuit to building control panels for HVAC system (whether shown on drawings or not). Connect to spare 20 amp, 1 pole circuit breaker in nearest 120 volt panel. Re-label circuit breaker accordingly. Provide locking device on breaker. Coordinate location with fire protection engineer (and drawings/specifications) prior to bid and provide all electrical. Coordinate final location and electrical requirements with damper installer after bid and provide all electrical

1.11 SUPERVISION OF THE WORK

A. Reference the General Conditions for additional requirements.

B. The Contractor shall provide experienced, qualified, and responsible supervision for work. A competent foreman shall be in charge of the work in progress at all times. If, in the judgement of the A/E, the foreman is not performing his duties satisfactorily, the Contractor shall immediately replace him upon receipt of a letter of request from the A/E. Once a satisfactory foreman has been assigned to the work, he shall not be withdrawn by the Contractor without the written consent of the A/E.

C. Provide field superintendent who has had a minimum of four (4) years previous successful experience on projects of comparable size and complexity. Superintendent shall be on the site at all times during construction and must have, as a minimum, an active Journeyman's Electrical License in the State of Florida.

D. Superintendent shall be employed by a currently licensed Florida Certified Electrical Contractor (EC) or a currently licensed Florida Registered Electrical Contractor (ER).

1.12 COORDINATION

A. Provide all required coordination and supervision where work connects to or is affected by work of other trades, and comply with all requirements affecting this Division. Work required under other divisions, specifications or drawings to be performed by this Division shall be coordinated with the Contractor and such work performed at no additional cost to Owner including but not limited to electrical work required for:

1. Sliding doors
2. Mechanical Division of the Specifications

B. Contractor shall obtain set of contract documents from Owner for all areas of work noted above and include all electrical work in bid whether included in Division 16 Contract Documents or not.

C. Installation studies shall be made to coordinate the electrical work with other trades. Work shall be preplanned. Unresolved conflicts shall be referred to the A/E prior to installation of the equipment for final resolution.

D. For locations where several elements of electrical or combined mechanical and electrical work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings at 1/4" scale showing the actual physical dimension required for the installation to assure proper integration of equipment with building systems and NEC required clearances. Coordination drawings shall be provided for all areas of conflict as determined by the A/E.

E. Secure accepted shop drawings from all required disciplines and verify final electrical characteristics before roughing power feeds to any equipment. When electrical data on accepted shop drawings differs from that shown or called for in Construction Documents, make adjustments to the wiring, disconnects, and branch circuit protection to match that required for the equipment installed.

F. Damage from interference caused by inadequate coordination shall be corrected at no additional cost to the Owner and the contract time for completion will not be extended.

G. The Contractor shall maintain an up-to-date set of Contract Documents (Drawings and Specifications) of all trades on the project site, including Mechanical and Electrical.

H. The Contract Documents describe specific sizes of switches, breakers, fuses, conduits, conductors, motor starters and other items of wiring equipment. These sizes are based on specific items of power consuming equipment (heaters, lights, motors for fans, compressors, pumps, etc.). The Contractor shall coordinate the requirements of each load with each load's respective circuitry shown and with each load's requirements as noted on its nameplate data and manufacturer's published electrical criteria. The Contractor shall adjust circuit breaker, fuse, conduit, and conductor sizes to meet the actual requirements of the equipment being provided and installed and change from single point to multiple points of connection (or vice versa) to meet equipment requirements. Changes due to these coordination efforts shall be made at no additional cost to the Owner.

1.13 PROVISION FOR OPENINGS

A. Locate openings required for work. Provide sleeves, guards or other accepted methods to allow passage of items installed.

B. Coordinate with roofing Contractor on installation of electrical items which pierce roof. Roof penetrations shall not void roof warranty.

C. Where work pierces waterproofing, it shall maintain the integrity of the waterproofing. Coordinate roofing materials which pierce roof for compatibility with membrane or other roof types with Contractor prior to installation.

1.14 SURFACE MOUNTED EQUIPMENT

A. Surface mounted fixtures, outlets, cabinets, conduit, panels, etc. shall have factory applied finish and/or shall be painted as directed by Engineer. Paint shall be in accordance with other applicable sections of the specifications for this project.

1.15 INSTALLATION

A. Erect equipment to minimize interferences and delays in execution of the work.

B. Take care in erection and installation of equipment and materials to avoid marring finishes or surfaces. Any damage shall be repaired or replaced as determined by the A/E at no additional cost to the Owner.

C. Equipment requiring electrical service shall not be energized or placed in service until A/E is

notified and is present or have waived their right to be present in writing. Where equipment to be placed in service involves service or connection from another Contractor or the Owner, the Contractor shall notify the Owner in writing when the equipment will be ready. The Owner shall be notified as far in advance as possible of the date the various items of equipment will be complete.

D. Equipment supports shall be secured and supported from structural members except as field accepted by the A/E in writing.

E. Plywood material shall not be used as a backboard for mounting panel boards, disconnects, motor starters, and dry type transformers. Provide "cast in place" type inserts or install expansion type anchor bolts. Electrical equipment shall not be mounted directly to dry wall for support without additional channels as anchors. Channels shall be anchored to the floor and structure above. Panelboards and terminal cabinets shall be provided with structural framing located within drywall partitions.

F. The Contractor shall keep the construction site clean of waste materials and rubbish at all times. Upon completion of the work, the Contractor shall remove from the site all debris, waste, unused materials, equipment, etc.

G. Inserts, pipe sleeves, supports, and anchorage of electrical equipment shall be provided. Where items are to be set or embedded in concrete or masonry, the items shall be furnished and a layout made prior to the setting or embedment thereof, so as to cause no delay to the project schedule.

1.16 PROGRESS AND RECORD DRAWINGS

A. Keep two sets of blueline prints on the job, and neatly mark up design drawings each day as components are installed. Different colored pencils shall be used to differentiate each system of electrical work. Cost of prints and this labor task shall be included under this Division. All items on Progress Drawings shall be shown in actual location installed. Change the equipment schedules to agree with items actually furnished.

B. Prior to request for substantial completion observation, furnish a set of neatly marked prints showing "as-installed" (as-built) condition of all electrical installed under this Division of the specifications. Marked up prints are to reflect all changes in work including change orders, field directives, addenda from bid set of Contract Documents, request for information responses, etc. Marked up set of prints to show:

1. All raceways 1-1/2" and above, exactly as installed.
2. All site raceways exactly as installed.
3. Any combining of circuits (which is only allowed by specific written permission) or change in homerun outlet box shall be made on as-builts.
4. Any circuit number changes on plan shall be indicated on as-builts.
5. Any panelboard schedule changes shall be indicated on as-builts and final panelboard schedules..

C. Marked up prints as noted above are to be submitted to A/E for review.. Contractor shall review submitted "as-builts" with Engineer in the field. Contractor shall verify every aspect for accuracy.

D. The changes and alterations shall be transferred to AutoCAD (Auto CAD Release 2006 or higher). Obtain CAD disk of the construction documents by the A/E, from the A/E. generate/update the CAD disks to include all changes, additions, etc. on the accepted marked up prints. Label each drawing "As-Built" and date. Submit as-built CAD disk and reproducible of the as-builts.

E. After acceptance of marked up prints by A/E with all changes, additions, etc. included on

accepted marked up prints, submit set prior to request for final payment and/or request for final observation.

F. Where the Contractor has failed to produce representative "as-built" drawings in accordance with requirements specified herein, the Contractor shall reimburse Engineer all costs to produce a set of "as-built" drawings to the Architect/Owner satisfaction.

1.17 OBSERVATION OF WORK REPORT

A. Reference the General Conditions.

B. Items noted by A/E or his representative during construction and before final acceptance which do not comply with the Contract Documents will be listed in a "Observation of Work" report which will be sent to the Contractor for immediate action. The Contractor shall correct all deficiencies in a prompt concise manner. After completion of the outstanding items, provide a written confirmation report for each item to the A/E. The report shall indicate each item noted, and method of correction. Enter the date on which the item was corrected, and return the signed reports so items can be rechecked. Failure to correct the deficiencies in a prompt concise manner or failure to return the signed reports shall be cause for disallowing request for payments.

C. Items noted after acceptance during one-year guarantee period shall be checked by the Contractor in the same manner as above. The signed reports are to be returned by him when the items have been corrected.

1.18 SYSTEMS WARRANTY

A. Reference the General Conditions.

B. The work shall include a one-year warranty. This warranty shall be by the Contractor to the Owner for any defective workmanship or material which has been furnished at no cost to the Owner for a period of one year from the date of substantial completion of each System. Warranty shall not include lamps in service after one month from date of substantial completion of the System. Explain the provisions of warranty to the Owner at the "Demonstration of Completed System" meeting to be scheduled with the Owner upon project completion.

C. Where items of equipment or materials carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material.

D. Where extended warranty or guarantee are called for herein, furnish three copies to be inserted in Operation and Maintenance Manuals.

E. All preventative maintenance and normal service will be performed by the Owner's maintenance personnel after final acceptance of the work which shall not alter the Contractor's warranty.

1.19 WASTE MATERIALS DISPOSAL

A. Contractor shall include in his bid the transport and disposal or recycling of all waste materials generated by this project in accordance with all rules, regulations and guidelines applicable. Contractor shall comply fully with Florida statute 403.7186 regarding mercury containing devices and lamps. Lamps, ballasts and other materials shall be transported and disposed of in accordance with all DEP and EPA guidelines applicable at time of disposal. Contractor shall provide owner with written certification of accepted disposal.

1.20 SUBSTANTIAL COMPLETION

A. The Contractor shall be fully responsible for contacting all applicable parties (A/E or Project Manager) to schedule required observations of the work by Engineer. A minimum of 72 hours notice shall be given for all required observations of the work by Engineer, and minimum of 120 hours for substantial completion observation. Time and date shall be agreed on by all applicable parties in writing.

B. Work shall be complete as required by authorities having jurisdiction and the general conditions of the contract prior to request for substantial completion observation. Work must be deemed substantially complete by A/E to fulfill requirements.

1.21 PROHIBITION OF ASBESTOS AND PCB

A. The use of any process involving asbestos or PCB, and the installation of any product, insulation, compound of material containing or incorporating asbestos or PCB, is prohibited. The requirements of this specification for complete and operating electrical systems shall be met without the use of asbestos or PCB.

B. Prior to the final review field visit, the Contractor shall certify in writing that the equipment and materials installed in this Project under this Division 16 contain no asbestos or PCB. Additionally, all manufacturers shall provide a statement with their submittal that indicates that their product contains no asbestos or PCB. This statement shall be signed and dated by a duly authorized agent of the manufacturer.

PART 2 - PRODUCTS (Not Applicable)

PART 3- EXECUTION (Not Applicable)

END OF SECTION

SECTION 16012
SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Requirements for submittals specifically applicable to Division 16 Sections, in addition to Division 1 - General Requirements and any supplemental requirements/conditions.

B. See Section 16013 - SUBSTITUTIONS for additional requirements when submittal consists of accepted substitution equipment.

1.3 SUBMITTAL OF "ACCEPTED SUBSTITUTE" EQUIPMENT/PRODUCT

A. Representation: In submitting item, equipment, product, etc. that has been listed on contract drawings, in contract documents or in an addenda, Contractor represents that he:

1. Has investigated substituted item and has determined that it is equal or superior to specified product in all aspects and that use of substituted item will not require any additional time to the Contract.
2. Will coordinate installation of accepted substitution into work, making changes as may be required to complete work in all aspects.
3. Waives all claims for additional costs related to substitution which may subsequently become apparent.
4. Will provide the same warranties for the substitution as for the product specified.
5. Will absorb all costs incurred by the substitution when affecting other trades including but not limited to electrical, structural, architectural, etc.
6. Will absorb any cost incurred by the Engineer in review of the substituted product if the acceptance of the substituted item creates the need for system modification and/or redesign, or if the substituting contractor exhibits negligence in his substituting procedure thus submitting inferior, misapplied or miss-sized equipment. In the event of additional engineering costs, the billing structure shall be agreed upon prior to review by all involved parties.

B. Substitutions that cannot meet space requirements or other requirements of these Specifications, whether accepted or not, shall be replaced at the Contractor's expense with no additional time added to the Contract.

1.4 SUBMITTALS

A. Submittals shall consist of a minimum of one (or if required) two hard cover view type 3-ring binder(s) White, sized to hold 8-1/2" x 11" sheets; one (1) for "ELECTRICAL SUBMITTALS" (Power and Lighting); one (1) for "SYSTEMS SUBMITTALS" (Sections 16700 through 16799). Where "SYSTEMS SUBMITTALS" (Sections 16700 through 16799) is not applicable, only one (1) binder is required.

1. Binder is to be adequately sized to comfortably hold required submittals. Minimum spline size to be 1", maximum spline size to be 3" (provide additional binders if 3" size is not sufficient to properly hold submittals).
2. Binder cover and spline to have outer clear vinyl pockets. Provide correct designation of

project in each pocket; see Binder Examples for Submittals included at end of this Section. Description sheet is to be white with black letters, minimum of 11" high and full width of pocket. Description is to describe project and match project drawing/project manual description. Description to include submittal type, i.e., "ELECTRICAL SUBMITTALS" for Power and Lighting, (and if required) "SYSTEMS SUBMITTALS" for Sections 16700 - 16799 submittals.

B. Submittals Binders to include:

1. First sheet shall be prepared and filled out by Contractor and shall list project addresses, telephones, etc.; see "PROJECT ADDRESSES" Form included at end of this section.
2. Second sheet in binder shall be a photocopy of the Electrical Index pages in Specifications.
3. Provide reinforced separation sheets tabbed with the appropriate specification reference number and typed index for each section in the Systems Schedule.
4. Submittals consisting of marked catalog sheets or shop drawings shall be inserted in the binder in proper order. Submittal data shall be presented in a clear and thorough manner. Clearly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Markings shall be made with arrows or circles (highlighting is not acceptable).
5. Shop Drawings: Drawings to include identification of project and names of Architect, Engineer, General Contractor, subcontractor and supplier, data, number sequentially and indicate the following:
    a) Fabrication and erection dimensions.
    b) Arrangements and sectional views.
    c) Necessary details, including complete information for making connections with other work.
    d) Kinds of materials and finishes.
    e) Descriptive names of equipment.
    f) Modifications and options to standard equipment required by the work.
    g) Leave blank area, size approximately 4 by 2 1/2 inches, near title block (for A/E's stamp imprint).
    h) In order to facilitate review of drawings, insofar as practicable, they shall be noted, indicating by cross reference the contract drawings, note, and specification paragraph numbers where items occur in the Contract Documents.
    i) Conduit/raceway rough-in drawings.
    j) Items requiring shop drawings include (but not limited to):
        1. Each section of 16700 broad section (i.e., fire alarm, television, etc.).
    k) See specific sections of Specifications for further requirements.
6. Product Data: Technical data is required for all items as called for in the Specifications regardless if item furnished is as specified.
    a) Submit technical data verifying that the item submitted complies with the requirements of the Specifications. Technical data shall include manufacturer's name and model number, dimensions, weights, electrical characteristics, and clearances required. Indicate all optional equipment and changes from the

standard item as called for in the Specifications. Furnish drawings, or diagrams, dimensioned and in correct scale, covering equipment, showing arrangement of components and overall coordination.

b) In order to facilitate review of product data, insofar as practicable, they shall be noted, indicating by cross reference the contract drawings, note, and/or specification paragraph numbers where and/or what item(s) are used for and where item(s) occur in the contract documents.

c) See specific sections of Specifications for further requirements.

1.5 PROCESSING SUBMITTALS

A. Submit under provisions of the General Requirements of the Contract and this section of the Specifications, whichever is the most strict.

B. Quantity of submittals with marking on each copy shall be submitted under provisions of General Requirements of the Contract, Division 1, and this and other sections of the Specifications. Original submittal must contain 3-ring binders with:

1. Project Addresses
2. Index
3. Separation Sheets
4. Basic Materials
5. Panelboards
6. Light Fixtures
7. Long Lead Items
8. Systems Product Data

C. Remainder of submittals are to be submitted no later then 60 days after award of contract or 60 days prior to Request for Substantial Completion whichever is earlier.

D. The Contractor shall review all submittals before submitting to the A/E. No request for payment will be considered until the submittals have been reviewed and submitted for approval.

E. Product Data: For standard manufactured materials, products and items, submit one (1) copy or sets of data (per binder). If submittal is rejected, resubmittal shall contain same quantity of new data.

F. Shop Drawings: For custom fabricated items and systems (16700) shop drawings, initially submit a transparency (suitable for reproduction) together with two (2) prints made therefrom. When submittal is acceptable, furnish one (1) print per binder made from the accepted transparency.

G. Shop Drawing Review Notation.

	Action	Description
1.	No Exception Noted	No exceptions taken. Resubmittal not required.
2.	Rejected	Not in compliance with Contract Documents. Resubmit.
3.	Submit Specific Item	Resubmit item as specified.
4.	Make Corrections Noted	Make corrections noted, resubmittal not required.
5.	Revise and Resubmit	Make corrections noted, resubmittal is required

6.	Review not Required	Not required for review. No action taken. Copy retained for reference.

H. Acceptance: When returned to Contractor, submittals will be marked with A/E's stamp. If box marked "Rejected" "Revise and Resubmit" or "Submit Specific Item" is checked, submittal is not accepted and Contractor is to correct and resubmit as noted, otherwise submittal is accepted and Contractor is to comply with notation making necessary corrections on submittal. Review comments will generally not be on each individual submittal sheet, and will be on a separate sheet attached to shop drawing transmittal, submittal as a whole or each submittal section.

I. Note that the acceptance of shop drawings or other information submitted in accordance with the requirements specified above, does not assure that the Engineer, Architect, or any other Owner's Representative, attests to the dimensional accuracy or dimensional suitability of the material or equipment involved, the ability of the material or equipment involved or the Mechanical/Electrical performance of equipment. Acceptance of shop drawings does not invalidate the plans and Specifications if in conflict, unless a letter requesting such change is submitted and accepted on the Engineer's letterhead.

1.6 DELAYS

A. Contractor is responsible for delays in job progress accruing directly or indirectly from late submissions or resubmissions of shop drawings, or product data.

1.7 RE-SUBMITTALS

A. The A/E shall be reimbursed for all costs to review resubmittals subsequent to the second submission for the same product. Cost will be billed to Contractor at Engineer's standard hourly rate.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

PROJECT ADDRESSES

OWNER:

ARCHITECT:

ENGINEER:

Matern Professional Engineering, Inc.
130 Candace Drive
Maitland, Florida 32751
Telephone No.: (407) 740-5020
Fax No.: (407) 740-0365

GENERAL CONTRACTOR:

SUBCONTRACTOR:

BINDER EXAMPLES FOR SUBMITTALS
Insert In Vinyl Pockets (Front & Spline) 3-Ring Binder

ORANGE COUNTY PUBLIC WORKS
BUILDINGS 1, 2 & 7 – SMOKE DAMPERS REPLACEMENT

MPE NO. 2011-011

SYSTEMS SUBMITTALS

(Size To 8-1/2" x 11")

ORANGE COUNTY PUBLIC WORKS
BUILDINGS 1, 2 & 7 – SMOKE DAMPERS REPLACEMENT

MPE NO.2011-011

SYSTEMS SUBMITTALS

(Size To 11")

SECTION 16014
REFERENCE STANDARDS AND REGULATORY REQUIREMENTS

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Reference Standards and Regulatory Requirements specifically applicable to Division 16 sections.

B. The requirements stated herein are in addition to Division 1 - General Requirements and any supplemental requirements/conditions.

1.3 REFERENCES

A. The following references may or may not be referenced within these specifications:

ADA	Americans with Disabilities Act
AHERA	Asbestos Hazard Emergency Response Act
AIA	American Institute of Architects (The) (202) 626-7300 - www.aiaonline.org
ANSI	American National Standards Institute (212) 642-4900 - www.ansi.org
ASCE	American Society of Civil Engineers (800) 548-2723/(703) 295-6300 - www.asce.org
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers (800) 527-4723/(404)636-8400 - www.ashrae.org
ASME	ASME International (The American Society of Mechanical Engineers International) (800) 843-2763 - www.asme.org
ASTM	American Society for Testing and Materials (610) 832-9585 - www.astm.org
BICSI	BICSI Executive Offices University of South Florida Tampa, FL 33620-8700
BOCC	Board of County Commissioners of Orange County
COO	City of Orlando
COOBC	City of Orlando Building Code

CRSI	Concrete Reinforcing Steel Institute (847) 517-1200 - www.crsi.org
DCA-ADAIA	Department of Community Affairs - Florida Americans with Disabilities Accessibility Implementation Act
DCA-ADAAG	Department of Community Affairs - Florida Americans with Disabilities Act Accessibility Guidelines
DER Rule 17-761	Department of Environmental Regulation, Chapter 17-761 on Underground Storage Tank Systems
DER Rule 17-762	Department of Environmental Regulation, Chapter 17-762 on Above Ground Storage Tank Systems.
DMS/DOC	Department of Management Services Division of Communications 2737 Centerview Drive Knight Building, Suite 110 Tallahassee, FL 32399-0950
DOCA or DCA	State of Florida Department of Community Affairs 2740 Center View Drive Tallahassee, Florida 32399-2100
EIA/TIA	Electronics Industries Alliance/Telecommunications Industry Association (703) 907-7500 - www.eia.org
EJCDC	Engineers' Joint Contract Documents Committee American Consulting Engineers Council 1015 15th Street, N.W. Washington, DC 20005
FAC	Florida Administrative Code
FBC	Florida Building Code
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FFPC	Florida Fire Prevention Code, Chapter 69A-60, FAC
FGC	Florida Building Code (Fuel Gas)
FLA.	State of Florida
FMC	Florida Building Code (Mechanical)
FMG	FM Global (formerly Factory Mutual System) (401) 275-3000 - www.fmglobal.com
FPC	Florida Building Code (Plumbing)

FS	Florida Statutes
ICC	International Code Council
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) (212) 419-7900 - www.ieee.org
IES	Illumination Engineering Society of North America (212) 248-5000 - www.iesna.org
ICPEA	International Power Cable Engineer's Association
LPCR	Local Power Company Requirements
LPI	Lightning Protection Institute (800) 488-6864/(847) 577-7200 - www.lightning.org
LTCR	Local Telephone Company Requirements
NECPA	National Energy Conservation Policy Act
NESC	National Electrical Safety Code (ANSI C2)
NEMA	National Electrical Manufacturers Association (703) 841-3200 - www.nema.org
NFPA	National Fire Protection Association (800) 344-3555/(617) 770-3000 - www.nfpa.org
OSHA	The Occupational Safety and Health Act
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association (703) 803-2980 - www.smacna.org
UFSRS	Uniform Fire Safety Rules and Standards of Insurance Division of State Fire Marshal
UL	Underwriters Laboratories, Inc. (800) 704-4050/(847) 272-8800 - www.ul.com
NEC	National Electrical Code

1.4 REGULATORY REQUIREMENTS

A. Conform to all the applicable requirements of the following codes, standards, guidelines, etc.. If there should be conflicting requirements between these codes, standards, guidelines, etc., the more or most stringent requirement shall apply that does not violate any codes or laws.

1. Standards and Miscellaneous Codes/Requirements (Comply with latest edition or notice available unless otherwise adopted by Authority having Jurisdiction):

a) American with Disabilities Act (ADA)

b) American National Standards Institute (ANSI)
c) American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
d) American Society of Mechanical Engineers (ASME)
e) American Society for Testing and Materials (ASTM)
f) Concrete Reinforcing Steel Institute (CRSI)
g) Electronics Industries Association/ Telecommunications Industry Association (EIA/TIA)
h) Institute of Electrical and Electronics Engineers (IEEE)
i) Illumination Engineering Society (IES)
j) Local Power Company Requirements (LPCR)
k) Lightning Protection Institute (LPI)
l) Local Telephone Company Requirements (LTCR)
m) National Energy Conservation Policy Act (NECPA)
n) National Electrical Safety Code (NESC)
o) National Electrical Manufacturers' Association (NEMA)
p) National Fire Protection Association (NFPA) Codes and Standards as adopted by Authority having Jurisdiction including the National Electrical Code (NEC)
q) The Occupational Safety and Health Act (OSHA)
r) Sheet Metal and Air Conditioning Contractors (SMACNA)
s) Underwriters Laboratories, Inc. (UL)
t) Applicable Florida Statutes and Referenced Codes/Standards.
u) All Federal, State, Local Codes, Laws and Ordinances as applicable.
v) Florida Building Code 2007 Edition with 2009 Supplement

2. CITY OF ORLANDO
a) Florida Building Code 2007 with 2009 Supplements
b) National Electrical Code 2008
c) Florida Fire Prevention Code 2007
d) NFPA 1 Uniform Fire Code 2006
e) NFPA 101 Life Safety Code 2006
f) Engineering Standards Manual
g) Orlando Urban Storm Water Management Manual
h) Florida Department of Transportation Manual on Uniform Traffic Control Device Standards
i) Florida Department of Transportation Roadway and Traffic Design Standards
j) City of Orlando Standard Specifications for Road, Bridge and Utility Construction
k) Florida Statutes
l) Florida Administrative Code
m) Orlando City Code

3. ORANGE COUNTY
a) Florida Building Code 2007 with 2009 supplement
b) Florida Residential Code 2007 with 2009 supplement
c) Florida Mechanical Code 2007 with 2009 supplement
d) Florida Plumbing Code 2007 with 2009 supplement
e) Florida Fuel Gas Code 2007 with 2009 supplement
f) National Electrical Code 2008
g) Florida Fire Prevention Code 2007
h) NFPA 1 Uniform Fire Code 2006 Florida Edition
i) NFPA 101 Life Safety Code 2006 Florida Edition

PART 2 - PRODUCTS (Not Applicable)
PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 16015
ELECTRICAL SYMBOLS AND ABBREVIATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Symbols and abbreviations specifically applicable to all Division 16 sections in addition to those in Division 1 - General Requirements and any supplemental requirements/conditions.

1.3 SYMBOLS

A. In general the symbols used on the drawings conform to the Standard Symbols of the Institute of Electrical and Electronic Engineers with the exception of special systems or agencies as hereinafter noted.
   Corps of Engineers.
   Special Symbols as shown in schedules or legends.

1.4 ABBREVIATIONS

A. The following abbreviations or initials are used.
   A/C Air Conditioning
   AFD Adjustable Frequency Drive
   A.C. Alternating Current
   ADD # Addendum #
   A/E Architect/Engineer (or Engineer when Architect not applicable)
   AFF Above Finished Floor
   AFG Above Finished Grade
   AHU Air Handler Unit
   AIC Amps Interrupting Capacity
   AL Aluminum
   ALT Alternate
   AMP Ampere
   ANSI American National Standards Institute
   AWG American Wire Gauge
   @ At
   B.C. Bare Copper
   BIDS Baggage Information Display System
   BLDG Building
   BRKR Breaker
   BTU British Thermal Unit
   BTUH BTU Per Hour
   C. Conduit
   C.B. Circuit Breaker
   CBM Certified Ballast Manufacturers
   CCTV Closed Circuit Television
   cd Candela
   CFM Cubic Feet per Minute
   CH Chiller
   CKT. Circuit
   CKT BRKR Circuit Breaker

C/L Center Line
Clg. Ceiling
Comp. Compressor
Conn. Connection
Cond. Condenser
Cont. Continuous
C.R.I. Color Rendering Index
C.T. Current Transformer
CU. Copper
C.U. Compressor Condenser Unit
C.W. Cold Water
D.B. Direct Burial
D.C. Direct Current
Disc. Disconnect
DN. Down
DPST Double Pole Single Throw
DWG Drawing
E.C. Electrical Contractor (or General Contractor)
ELEV. Elevator
EMT Electrical Metallic Tubing
Equip. Equipment
EST Estimate
FAAP Fire Alarm Annunciator Panel
FACP Fire Alarm Control Panel
FARP Fire Alarm Remote Panel
FATC Fire Alarm Terminal Cabinet
FCCP Fire Alarm Command Center Panel
FHC Fire Hose Cabinet
FIDS Flight Information Display System
FLA Full Load Amperes
FT. Feet
FLR Floor
F.C. Footcandles
FVNR Full Voltage Non-Reversing
GAL. Gallon
Galv. Galvanized
GPH Gallons per Hour
GPM Gallons per Minute
GFI Ground Fault Interrupting
GRS Galvanized Rigid Steel Conduit
GND. Ground
HTG Heaters
HT Height
HZ Hertz (Cycles)
HPF High Power Factor
HPS High Pressure Sodium
HP. Horsepower
HR. Hour
H.S. Heat Strip
ICTC Intercom Termination Cabinet
IMC Intermediate Metallic Conduit
Incand. Incandescent
in. Inches
J.B. Junction Box

KVA KiloVolt Ampere
KW Kilowatts
KWH Kilowatt Hour
K Kelvin
L.L.D. Lamp Lumen Depreciation
LED Light Emitting Diode
LIU Light Interface Unit (Fiber Optic Patch Panel)
LT. Light
LTG. Lighting
LTS. Lights
L.P.F. Low Power Factor
M.C.B. Main Circuit Breaker
M.L.O. Main Lugs Only
Maint. Maintenance
MH. Manhole; Metal Halide
MFG. Manufacturer
max. Maximum
MCM/KCMIL Thousand Circular Mils
MPH Miles Per Hour
MM Millimeter
Min. Minimum
MCP Motor Circuit Protector
MTD Mounted
N. Neutral
NEC National Electrical Code
NEMA National Electrical Manufacturers Association
NFPA National Fire Protection Association
N.P.T. National Pipe Thread
NF Non Fused
N.C. Normally Closed
N.O. Normally Open
NIC. Not in Contract
No. Number
OB Outlet Box
OD Outside Diameter
O.L. Overload
OLS Overloads
OS&Y Outside Screw and Yoke (Sprinkler)
% Percent
Ø Phase
P. Pole
PL Compact Fluorescent Lamp
P.T. Potential Transformer
PSF Pounds per Square Foot
PSI Pounds per Square Inch
PB Pullbox
PNL Panel
PR Pair
Pri. Primary
PTZ Pan, Tilt, Zoom
PVC Polyvinyl Chloride
Recept. Receptacle
RPM Revolutions per Minute
R.S. Rapid Start

SCA Short Circuit Amps
Sec. Secondary
SHT Sheet
S/N Solid Neutral
SPST Single Pole Single Throw
SF Square Foot
SW. Switch
SWBD Switchboard
Sys. System
THHN; THWN Nylon Jacketed Wire
TSP Twisted Shielded Pair
TTB Telephone Terminal Board
TTC Telephone Terminal Cabinet
TV Television
TVTC Television Terminal Cabinet
TVEC Television Equip. Cabinet
TYP Typical
Temp. Temperature
UL Underwriters' Laboratories
UTP Unshielded Twisted Pair
VFD Variable Frequency Drive
VHF Very High Frequency
VHO Very High Output
V Volt
VA Volt Amperes
Vol. Volume
VV Video Visitation
W Wire
W.P. Weatherproof
XFMR Transformer
Y Wye
Yd. Yard
Yr. Year
3R Rainproof
4X Stainless Steel Dustight, Watertight

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 16060 - MINOR ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes the requirements for electrical demolition.

B. Provide and install all equipment, labor, material, accessories, and mounting hardware for completion of minor electrical demolition for remodeling.

1.3 REFERENCES

A. NFPA 70 National Electrical Code
B. Underwriters Laboratories

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on field observation and existing record documents. Report discrepancies to Architect/Engineer before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

C. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner, Architect/Engineer at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

D. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner, Architect/Engineer and local fire service at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area. For the full period of time the system is deactivated, a safety fireman's watch is required to be provided to enact a fire watch for areas that experience a loss of fire protection and notification coverage due to the modifications.

E. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Notify Owner, Architect/Engineer and Telephone Utility Company at least 24 hours before partially or

completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

D. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

E. Repair adjacent construction and finishes damaged during demolition and extension work.

F. Seal openings in walls, floors, etc. and fire stop in accordance with the accepted UL detail to maintain integrity of assembly.

G. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate and as required to comply with the requirements of the NEC.

H. Extend existing installations using materials and methods compatible with existing electrical installations. Extension must meet or exceed the materials/methods specified in the contract documents.

END OF SECTION

SECTION 16061 - INVESTIGATION OF EXISTING ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes testing and documentation of existing electrical systems.

1.3 REFERENCES

A. IEEE Recommended Practices

1.4 DESCRIPTION

A. Test the essential features of the following existing electrical systems:

1. Fire detection devices, smoke detection devices.

B. Each system shall be tested once only, and after completion of testing, results given to the Owner, Engineer and/or Owner's representative. Point out any non-operational function noticed during testing.

C. Document the existing conditions and operation of the existing electrical systems prior to any work.

D. Contractor is responsible for all non-working systems and their components unless non-working status is verified prior to work on system.

1.5 TIME

A. The testing shall be held at a date to be agreed upon in writing by the Owner or his Representative.

1.6 ATTENDING PARTIES

A. The testing shall be held in the presence of the Owner, or his Representative and Contractor.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PERFORMANCE VERIFICATION

A. Test the operation of each of the following existing devices and associated systems:

1. Fire Alarm System:

a) Test each pull station and record location of each tested device, and note either operational or non operational.

b) Test Fire Alarm System sufficiently to determine existing operating condition of system. Pull the pull stations, check automatic detectors. Test minimum of one manual device per zone, and one automatic device per zone.

c) Upon alarm activation verify that the fire alarm zone lights and audible/visual signals function properly. Verify that the local fire department or responding agency receives an automatic signal.

B. The Electrical Contractor shall investigate all existing systems as called out in this performance verification prior to the beginning of any work which could affect these systems.

C. Each system shall be retested after completion of remodel and/or renovation to ensure proper

operation is maintained. Demonstrate operation per Section 16095 Demonstration of Completed Electrical Systems.

3.2 INVESTIGATION/TESTING FORMS

A. Submit Existing Facilities Investigation Form and advise Owner/Engineer of all deficiencies in system(s) prior to work. All systems will be assumed to be fully operational if Form not received by Engineer prior to work on system.

B. Submit five copies of the Existing Facilities Investigation Form for each device tested, signed by the Contractor, Subcontractor and Owner, and submit each test result to the Owner's Authorized Representative.

Attachments:
Existing Facilities Investigation
Ground Test Information

END OF SECTION

EXISTING FACILITIES INVESTIGATION

PROJECT:_____

The existing systems on the above project have been investigated and checked to determine the existing condition of all existing electrical systems within the area(s) affected by the scope of work of this project. The investigation consisted of testing all electrical systems/devices as required by Section 16061 Investigation of Existing Electrical Systems.

All equipment was found to be operational except as noted herein (list below):

_____
PRIME CONTRACTOR

_____
AUTHORIZED SIGNATURE AND TITLE

DATE_____

_____
OWNER'S AUTHORIZED REPRESENTATIVE

_____
AUTHORIZED SIGNATURE AND TITLE

DATE_____

Note To Contractor: Upon completion of investigation and one week prior to the commencement of work, submit five copies of the completed Existing Facilities Investigation Form to the Owner's Authorized Representative, signed and dated by the Contractor. The Owner’s Authorized Representative’s signature and date is required to verify receipt of Form. Retain copy(ies) and submit copy of Form in each Operation and Maintenance Manual. Contractor shall submit quantities of Forms as required to present required information.

GROUND TEST INFORMATION

PROJECT NAME_____

GROUND TYPE_____

TEST BY_____

DATE OF TEST_____

GROUND LOCATION:_____

GROUND TYPE (Rod, Water pipe, etc.) _____

PRIOR TO CONNECTION TO SYSTEM

GROUND _____ (OHMS)

AFTER CONNECTION TO SYSTEM

GROUND _____ (OHMS)

WEATHER CONDITIONS (Wet/Dry)_____

SOIL CONDITIONS (Wet/Dry)_____

_____
CONTRACTOR'S REPRESENTATIVE

DATE_____

_____
ENGINEER'S REPRESENTATIVE

DATE_____

_____
OWNER'S REPRESENTATIVE

DATE_____

SECTION 16095 - DEMONSTRATION OF COMPLETED ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes the requirements for demonstration of completed electrical systems:

1.3 DESCRIPTION

A. Demonstrate to Owner the essential features of the following electrical systems:

1. Communications Systems
   a) Each and every system included in Sections 16700 through 16799.

B. Upon completion of testing, each system is to be demonstrated only once.

1.4 TIME

A. The demonstration shall be held upon completion of testing of all systems at a date to be agreed upon in writing by the Owner or his representative.

1.5 ATTENDING PARTIES

A. The demonstration shall be held by this Contractor in the presence of the Owner and the manufacturer's representative.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 DEMONSTRATION

A. Demonstrate the function and location (in the structure) of each system, and indicate its relationship to the riser diagrams and drawings.

B. Demonstrate by "start-stop operation" how to work the controls, how to reset protective devices, how to replace fuses, and what to do in case of emergency.

C. Performance Verification and Demonstration to Owner

1. Submit Check Out Memo form for each item, equipment, and system. Copy to be included in each Operation and Maintenance Manual.

END OF SECTION

CHECK OUT MEMO

Check Out Memo shall be completed and a copy provided to the Owner at the Owner's Performance Verification and Demonstration Meeting. A copy shall also be included in the specification section of each O & M Manual for the equipment checked.

Project Name _____

Type of Equipment Checked _____

Equipment Number _____

Equipment Manufacturer _____

Signature below by the manufacturer's authorized representative signifies that the equipment has been satisfactorily tested and checked out on the job by the manufacturer.

1. The attached Test and Data and Performance Verification information was used to evaluate the equipment installation and operation.
2. The equipment is properly installed, has been tested by the manufacturer's authorized representative, and is operating satisfactorily in accordance with all requirements, except for items noted below.*****
3. Written operating and maintenance information has been presented and reviewed in detail with the Contractor.
4. Sufficient copies of all applicable operating and maintenance information, parts lists, lubrication checklists, and warranties have been furnished to the Contractor for insertion in the Operation and Maintenance Manuals.

CHECKED BY:

_____
MANUFACTURER'S REPRESENTATIVE (print)

_____
ADDRESS

_____
TELEPHONE, FAX, E-MAIL

_____
MANUFACTURER'S REPRESENTATIVE (signature, title)

_____
DATE CHECKED

WITNESSED BY:

_____
CONTRACTOR'S REPRESENTATIVE (signature, title)

***EXCEPTIONS NOTED AT TIME OF CHECK-OUT (USE ADDITIONAL PAGE IF NECESSARY)**

SECTION 16098
OPERATION AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 and Division 16 Specification Sections apply to this Section.

B. The requirements in this section of the specifications are in addition to all requirements in sections referenced above.

1.2 SUMMARY

A. This section includes the requirements for Operation and Maintenance Manuals (O & M Manuals) specifically applicable to Division 16 Sections, in addition to Division 1 - General Requirements and any supplemental requirements/conditions.

1.3 OPERATION AND MAINTENANCE MANUALS

A. General: Refer to Section 01770 Closeout Procedures.

B. O& M Manuals shall consist of a minimum of one (or if required) two hard cover view type 3-ring binder(s) sized to hold 8 1/2" x 11" sheets; one (1) for SYSTEMS OPERATION AND MAINTENANCE (Sections 16700 thru 16799) (blue).

1. Each binder is to be adequately sized to comfortably hold required submittals. Minimum spline size to be 1", maximum spline size to be 3". Provide additional binders if 3" size is not sufficient to properly hold submittals.

2. Binder cover and spline to have outer clear vinyl pockets. Provide correct designation of project in each pocket; see Binder Examples for O & M's at the end of this Section. Description sheet is to be white with black letters, minimum of 11" high and full width of pocket. Description is to describe project and match project drawing/project manual description. Description to include submittal type, i.e. SYSTEMS OPERATION AND MAINTENANCE for Sections 16700 - 16799.

C. O & M Data:

1. Manufacturer's operation and maintenance data is required for all items as called for in the specifications. O & M Manuals shall include manufacturer's name, model number(s), characteristics, manufacturer's agent, service agent, supplier, where and/or what item(s) are used for and description (i.e. surge suppression - switchboard MDPA).

2. Include troubleshooting instructions, list of special tools required, theory of operation, manufacturer's care and cleaning, preventative maintenance instructions, wiring diagrams, and point-to-point schematics.

D. O & M Manuals to include:

1. Completed forms and information per Division 1, General Requirements, and this section of the specifications.
   a) Table of Contents
   b) Project Addresses
   c) Reinforced Separation Sheets tabbed with the appropriate specification reference number and typed index for each Section in the Systems Schedule
   d) Check Out Memo
   e) Conductor Insulation Resistance Test Memo
   f) D-C High Voltage Cable Test Report
   g) Ground Test Information
   h) Motor Test Information
   i) Voltage and Amperage Readings Tabulated Data.

j) Progress and Record Drawing Certification
k) Spare Parts Certification Memo

2. Shop Drawings: Shop drawings shall be a copy of the final and accepted shop drawing submitted as required in Section 16012 "Submittals". These shall be inserted in binder in proper order.

3. Product Data: Product data and/or Catalog sheets shall be a copy of the final and accepted submittal submitted as required in Section 16012 "Submittals". These shall be inserted in binder in proper order.

4. Warranty/Guarantee: Provide copy of warranty/guarantee in respective location in O & M binder, (Power and Lighting) (Systems). Original warranty/guarantee is to be incorporated into separate project warranty book with warranty/guarantees provided for other sections and divisions of the specifications and submitted for Architectural/Owner acceptance.

5. Copies of electrical panel schedules and electrical panel directories included with the corresponding specification section

   a) Each and every part of the Systems sections of these Specifications, 16700 thru 16799.

6. Sections 16700 thru 16799
   a) Installer's name, address, phone, etc. for each system.
   b) Authorized representatives name, address, phone, etc. for each system.
   c) Equipment supplier's name, address, phone, etc. for each system.
   d) Surge Suppression.
      1. Product data and/or catalog sheets on equipment applicable to this project.
      2. Parts list.
      3. Recommended testing and replacement procedures.
   e) Fire Alarm, Sound/Paging, Television, Security, Closed Circuit systems.
      1. Product data and/or catalog sheets on equipment applicable to this project.
      2. Parts list.
      3. Installation/removal instructions.
      4. Wiring diagrams of panels.
      5. Point-to-point wiring diagrams of system.
      6. Operation and maintenance requirements.
      7. Shop drawing as submitted and accepted in submittal process.
      8. Check-Out Memo Form
   f) Telephone, Computer Systems.
      1. Product data and/or catalog sheets on equipment applicable to this project.
      2. Parts list.
      3. Wiring diagrams of panels.
      4. Shop drawing as submitted and accepted in submittal process.

1.4 PROCESSING SUBMITTALS

A. Submit a minimum of three (3) sets of O & M Manuals, two (2) sets for Owner, one (1) set for Engineer.

B. The Contractor shall review the manuals before submitting to the A/E. No request for payment will be considered until the brochure has been reviewed and submitted for acceptance.

C. Provide additional copies if additional copies are required in other Divisions and/or sections of these specifications.

1.5 DELAYS

A. Contractor is responsible for delays in job project accruing directly or indirectly from late submissions or resubmissions of shop drawings, or product data.

1.6 RESUBMITTALS

A. The A/E shall be reimbursed cost to review re-submittals subsequent to the second submittal.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

PROJECT ADDRESSES

OWNER:

ARCHITECT:

CONSULTING ENGINEER: Matern Professional Engineering, Inc.
130 Candace Drive
Maitland, Florida 32751
Telephone No.: (407) 740-5020
Fax No.: (407) 740-0365

GENERAL CONTRACTOR:

SUBCONTRACTOR:

CHECK OUT MEMO FORM

This form shall be completed and a copy provided to the Owner at the Owner's Performance Verification and Demonstration meeting. A copy shall also be included in the specification section of each O & M Manual for the equipment checked.

Project Name:

Type of equipment checked:
Equipment Number:

Name of manufacturer of equipment:

Signature below by the manufacturer's authorized representative signifies that the equipment has been satisfactorily tested and checked out on the job by the manufacturer.

1. The attached Test and Data and Performance Verification information was used to evaluate the equipment installation and operation.

2. The equipment is properly installed, has been tested by the manufacturer's authorized representative, and is operating satisfactorily in accordance with all requirements, except for items noted below.*

3. Written operating and maintenance information has been presented to the Contractor, and gone over with him in detail.

4. Sufficient copies of all applicable operating and maintenance information, parts lists, lubrication checklists, and warranties have been furnished to the Contractor for insertion in the Operation and Maintenance Manuals.

Checked By: (Print or Type Name of Manufacturer's Representative)

(Address and Phone No. of Representative)

(Signature and Title of Representative)

(Date Checked)

Witnessed By: Signature and Title of Contractor Rep.)

*Exceptions Noted At Time Of Check-Out (use additional page if necessary)

CONDUCTOR INSULATION RESISTANCE TEST MEMO

PROJECT NAME:_____

CONDUCTOR FROM _____ TO

SIZE

INSULATION TYPE

INSULATION VOLTAGE RATING

DATE _____ TIME

WEATHER CONDITIONS

TEST VOLTAGE (DC)

RANGE

MEGGER INSTRUMENT/SERIAL NUMBER

TESTING METHODOLOGY

INSULATION RESISTANCE MEASUREMENT (ACCEPTABLE MEASUREMENT NOT TO BE LESS THAN (1) MEGOHM):

PHASE A TO GROUND _____

PHASE B TO GROUND _____

PHASE C TO GROUND _____

NEUTRAL TO GROUND _____

ISOLATED GROUND TO GROUND

CONTRACTOR'S REPRESENTATIVE:

DATE:

OWNER'S REPRESENTATIVE:

DATE:

ENGINEER'S REPRESENTATIVE:

DATE:

D-C HIGH VOLTAGE CABLE TEST REPORT

Project Name:_____

Location:_____

Description:_____

Rated Voltage:_____

TEST DATA

Set Leakage @ Test Voltage _____ma Variac_____
Pri. Voltage_____
Sphere Gap _____ Inches
Duct Temp._____ Ambient Temp._____ Weather_____
Cable Status_____ 1 hour prior to test

_____
_____

Phase or Conductor	A	B	C	Remarks
Starting Time				
	MA	MA	MA	
0				
15 sec.				
30 sec.				
45 sec.				
1 min.				
2 min.				
3 min.				
4 min.				
5 min.				

Final Test Voltage _____

Time Finish: _____

KV DC after 1 min.

Test Procedure _____ No. of Terminals _____
Joints _____

Witnessed by:_____ Performed by:_____

GROUND TEST INFORMATION

PROJECT NAME:_____

GROUND TYPE:_____

TEST BY:_____

DATE OF TEST:_____

GROUND LOCATION:_____

GROUND TYPE (Rod, Water pipe, etc.):

PRIOR TO CONNECTION TO SYSTEM

GROUND: _____ (OHMS)

AFTER CONNECTION TO SYSTEM

GROUND: _____ (OHMS)

WEATHER CONDITIONS (Wet/Dry):

SOIL CONDITIONS (Wet/Dry):

CONTRACTOR'S REPRESENTATIVE:

DATE:

ENGINEER'S REPRESENTATIVE:

DATE:

OWNER'S REPRESENTATIVE:

DATE:

MOTOR TEST INFORMATION

PROJECT NAME:
DESCRIPTION OF MOTOR:
NAME OF CHECKER:
DATE CHECKED:

(a) Name and identifying mark of motor (indicate at existing)

(b) Manufacturer

(c) Model Number

(d) Serial Number

(e) RPM

(f) Frame Size

(g) Code Letter

(h) Horsepower

(i) Nameplate Voltage and Phase

(j) Nameplate Amps

(k) Actual Voltage

(l) Actual Amps

(m) Starter Manufacturer

(n) Starter Size

(o) Heater Size, Catalog No. and Amp Rating

(p) Manufacturer of dual-element fuse

(q) Amp rating of fuse

(r) Power Factor

CONTRACTOR'S REPRESENTATIVE:

DATE:

SIGNATURE OF CHECKER:

DATE:

OWNER'S AUTHORIZED REPRESENTATIVE:

PROGRESS AND RECORD DRAWING CERTIFICATION

NAME OF PROJECT:

DIVISION NUMBER AND NAME:

This is to certify that the attached marked-up design prints were marked as the items were installed at the site during construction, and that these prints represent as accurate "As-Builts" record of the work as actually installed. One copy will be turned over to the Owner at the instruction in Operation Conference. The duplicate copy is for the Engineer's files.

_____

Name Of General Contractor

_____

BY: Authorized Signature And Title

Date

Name Of Subcontractor

_____

BY: Authorized Signature And Title

Date

SPARE PARTS CERTIFICATION MEMO

This form shall be completed and a copy provided to the Owner at the Owner's Performance Verification and Demonstration meeting. A copy shall also be included in the specification section of each O & M Manual for the equipment checked.

Project Name:

Type of Spare Parts:

Specification Reference:

Quantity of Spare Parts:

Signature below by the contractor signifies that the spare parts required by the drawings and/or specifications have been turned over to the Owner.

_____

(Name of General Contractor)

_____

(Signature, Title, Date)

_____

(Name of Subcontractor)

_____

(Signature, Title, Date)

_____

(Name of Owner)

_____

(Signature, Title, Date)

VOLTAGE AND AMPERAGE READINGS (TABULATED DATA)

PROJECT NAME:_____
SWITCHGEAR/PANELBOARD

FULL LOAD AMPERAGE READINGS:

DATE _____
TIME _____

PHASE A. _____

B. _____

C. _____

N._____

GROUND_____

FULL LOAD VOLTAGE READINGS:

DATE
TIME

PHASE A TO N _____ A TO B

B TO N _____ A TO C

C TO N _____ B TO C

VOLTAGE AT THE END OF THE LONGEST BRANCH

TYPE OF LOAD

NO LOAD VOLTAGE READINGS:

DATE
TIME

PHASE A TO N _____ A TO B

B TO N _____ A TO C

C TO N _____ B TO C

_____ ENGINEERS REPRESENTATIVE

_____ OWNER'S AUTHORIZED REPRESENTATIVE

_____ CONTRACTORS REPRESENTATIVE

_____ DATE

BINDER EXAMPLES FOR SUBMITTALS
Insert In Vinyl Pockets (Front & Spline) 3-Ring Binder

ORANGE COUNTY PUBLIC WORKS
BUILDINGS 1, 2 & 7 – SMOKE DAMPERS REPLACEMENT

MPE NO. 2011-011

SYSTEMS OPERATION AND MAINTENANCE BROCHURE

(Size To 8-1/2" x 11")

ORANGE COUNTY PUBLIC WORKS BUILDINGS 1, 2 & 7 – SMOKE DAMPERS REPLACEMENT

MPE NO. 2011-011

SYSTEMS OPERATION AND MAINTENANCE BROCHURE

(Size To 11")

SECTION 16111
CONDUIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes requirements for electrical conduit.

B. Provide and install all equipment, labor, material, accessories, and mounting hardware for a complete and operating system for the following:

1. Rigid Metal Conduit (RMC) NEC 344
2. Aluminum Rigid Metallic Conduit (RMC) NEC 344
3. Intermediate Metal Conduit (IMC) NEC 342
4. Flexible Metal Conduit (FMC) NEC 348
5. Liquidtight Flexible Metal Conduit (LFMC) NEC 350
6. Electrical Metallic Tubing (EMT) NEC 358
7. Rigid Polyvinyl Chloride Conduit (Type PVC) NEC 352
8. Fittings and Conduit Bodies

1.3 REFERENCES

A. ANSI C80.1 Electrical Rigid Steel Conduit, Zinc Coated
B. ANSI C80.3 Steel Electrical Metallic Tubing, Zinc Coated
C. ANSI C80.5 Electrical Rigid Aluminum Conduit
D. ANSI/NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable
E. ANSI/NFPA 70 National Electrical Code
F. NECA Standard Practice of Good Workmanship in Electrical Contracting
G. NEMA RN 1 Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
H. NEMA TC 2 Electrical Polyvinyl Chloride (PVC) Conduit (EPC 40, EPC 80)
I. NEMA TC 3 Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories as suitable for purpose specified and shown.

1.5 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70. (See Drawings and this and other sections of these Specifications for additional requirements).

B. Raceways and conduits shall begin at an acceptable enclosure and terminate only in another such enclosure except conduit/raceway stub-outs.

C. A raceway shall be provided for all electrical power and lighting, and electrical systems unless specifically specified otherwise.

1.6 SUBMITTALS

A. Submit catalog cut sheet showing brand of conduit to be used and showing that conduit is UL listed and labeled, and manufactured in the United States.

B. Submit catalog cut sheet on all types of conduit bodies and fittings.

C. Product data shall be submitted for acceptance on:

1. Conduits.
2. Conduit straps, hangers and fittings.
3. PVC solvent(s) and bending box.
4. Fitting entering and leaving the ground or pavement.

D. Submit UL listed fire and smoke stopping assemblies for each applicable application.

E. Product data shall prove compliance with Specifications, National Electrical Code, National Board of Fire Underwriters, manufacturers' specifications and written installation data.

1.7 PROJECT RECORD DOCUMENTS

A. Submit record documents to accurately record actual routing of conduits larger than 1.25".

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, properly store and protect products at the site.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from sun, rain, corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.9 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 - PRODUCTS

2.1 GENERAL

A. All conduits shall bear UL label or seal and shall be manufactured in the United States.
B. Conduit systems and all related fittings, boxes, supports, and hangers must meet all the requirements of national, state, local and other federal codes where applicable.

2.2 MINIMUM TRADE SIZE

A. Homeruns: 3/4" C.
B. Underground Branches: 3/4".
C. Aboveground Branches: 1/2".
D. Flexible and seal-tite metallic conduit 1/2" C (maximum 6' long).

2.3 RIGID METAL CONDUIT

A. Comply with:
1. ANSI C80.1.
2. UL 6.
3. NEC 344.

B. Conduit material:
1. Zinc coated or hot dipped galvanized steel.

C. Fittings:

1. Threaded.
2. Insulated bushings shall be used on all rigid steel conduits terminating in panels, boxes, wire gutters, or cabinets, and shall be impact resistant plastic molded in an irregular shape at the top to provide smooth insulating surface at top and inner edge. Material in these bushings must not melt or support flame.
3. Zinc plated or hot dipped galvanized malleable iron or steel.

D. Conduit Bodies:
1. Comply with ANSI/NEMA FB 1.
2. Threaded hubs.
3. Zinc plated or hot-dipped galvanized malleable iron.

2.4 ALUMINUM RIGID METAL CONDUIT

A. Comply with:
1. ANSI C80.5.
2. UL 6.
3. NEC 344.

B. Conduit material: Aluminum.

C. Fittings:
1. Threaded.
2. Aluminum.
3. Insulated bushings on terminations.

D. Conduit bodies:
1. Comply with ANSI/NEMA FB 1.
2. Threaded hubs.
3. Aluminum.

2.5 INTERMEDIATE METAL CONDUIT

A. Comply with:
1. UL Standard 1242.
2. NEC 342.

B. Conduit material: Zinc coated steel.

C. Fittings:
1. Threaded.
2. Zinc plated malleable iron.
3. Insulated bushings on terminations.

D. Conduit bodies:
1. Comply with ANSI/NEMA FB 1.
2. Threaded hubs.
3. Zinc plated or hot-dipped galvanized malleable iron.

2.6 RIGID METAL CONDUIT PVC COATED

A. Comply with:
1. UL 6.
2. ANSI C80.1.
3. NEC 344.
4. NEMA RN1.

B. Conduit material: Hot-dipped galvanized rigid steel with external PVC coating, 40 mil thick.

C. Fittings:
1. Threaded.

2. Insulated bushings on terminations.
3. Zinc plated or hot-dipped galvanized malleable iron or steel with external PVC coating, 40 mil thick.

D. Conduit bodies:

1. Comply with:
   a) ANSI/NEMA FB 1.
   b) Threaded hubs.
2. Zinc plated or hot-dipped galvanized malleable iron with external PVC coating 40 mil thick.

2.7 FLEXIBLE METAL CONDUIT

A. Comply with:
1. NEC 348.
2. ANSI/UL 1.

B. Conduit material: Steel, interlocked.

C. Fittings:
1. ANSI/NEMA FB 1.
2. ANSI/UL 514B.
3. Malleable iron, zinc plated.
4. Threaded rigid and IMC conduit to flexible conduit coupling.
5. Direct flexible conduit bearing set screw type not acceptable.

2.8 LIQUID-TIGHT FLEXIBLE METAL CONDUIT

A. Comply with:
1. NEC 350.
2. ANSI/UL 360.

B. Conduit material:
1. Flexible hot-dipped galvanized steel core, interlocked.
2. Continuous copper ground built into core up to 1-1/4” size.
3. Extruded polyvinyl gray jacket.

C. Fittings:
1. Threaded for IMC/rigid conduit connections.
2. Accepted for hazardous locations where so installed.
3. Provide sealing washer in wet/damp locations.
4. Compression type.
5. ANSI/NEMA FB 1.
6. ANSI/UL 514B.
7. Zinc plated malleable iron or steel.

2.9 ELECTRICAL METALLIC TUBING

A. Comply with:
1. UL 797.
2. ANSI C80.3.
3. NEC 358.
4. ANSI/UL797.

B. Conduit material: Galvanized steel tubing.

C. Fittings:
1. ANSI/NEMA FB 1.
2. Set screw.
3. Die Cast.
4. Zinc plated malleable iron or steel.

5. Concrete tight.
6. T&B Series 5031/5030.

2.10 RIGID POLYVINYL CHLORIDE CONDUIT

A. Comply with:
   1. NEMA TC 2.
   2. UL 651.
   3. NEC 352.

B. Conduit material:
   1. Shall be high impact PVC, tensile strength 55 psi, flexural strength 11000 psi.

C. Fittings:
   1. NEMA TC 3.
   2. UL 514.

D. General:
   1. Shall be UL listed and identified.
   2. Shall conform to all national, state and local codes.
   3. Manufacturer shall have five years experience in manufacturing PVC conduits.

2.11 EXPANSION FITTINGS

A. Expansion fittings shall be:
   1. UL listed, hot dipped galvanized inside and outside providing a 4” expansion chamber when used with rigid conduit, intermediate metal conduit and electrical metallic conduit, or:
   2. Be polyvinyl chloride and shall meet the requirements of and as specified elsewhere for non-metallic conduit and shall provide a 6” expansion chamber.
   3. Hot dipped galvanized expansion fitting shall be provided with an external braided grounding and bonding jumper with accepted clamps, UL listed for the application.
   4. Expansion fitting, UL listed for the application and in compliance with the National Electrical Code without the necessity of an external bonding jumper may be considered. Submit fitting with manufacturer's data and UL listing for acceptance prior to installation.

PART 3 - EXECUTION

3.1 LOCATION REQUIREMENTS

A. Underground Installations:
   1. Use rigid non-metallic conduit (PVC) only unless local Authority Having Jurisdiction or applicable codes/utility requirements, etc. require rigid steel conduit.
   2. All conduits or elbows entering, or leaving the ground shall be rigid steel conduit coated with asphaltic paint.
   3. All underground raceways (with exception of raceways installed under floor slab) shall be installed in accordance with NEC 300.5, except the minimum cover for any conduit shall be 2’. Included under this Section shall be the responsibility for verifying finished lines in areas where raceways will be installed underground before the grading is complete.
   4. Where rigid metallic conduit is installed underground as noted above it shall be coated with waterproofing black mastic before installation, and all joints shall be re-coated after installation.
   5. PVC runs over 150’ in length shall utilize rigid steel 90 degree elbows at each riser and at each change in direction. Elbows shall be coated with black mastic or PVC coating. Bond all metal elbows per NEC 250.80 and NEC 300.5.
   6. All underground service lateral raceways shall be protected as required by NEC 300.5, including requirements for installation of warning tape.

B. In Slab Above or on Grade:
   1. Use coated rigid steel conduit, coated intermediate metal conduit (if accepted) or rigid non-metallic conduit.
   2. Coating of metallic conduit to be black asphaltic or PVC.

C. Penetration of Slab:
   1. Exposed Location:
      a) Where penetrating a floor in an exposed location from underground or in slab, a black mastic coated or PVC coated galvanized rigid steel conduit shall be used.
   2. Concealed Location:
      a) Where penetrating a floor in a location concealed in block wall and acceptable by applicable codes, rigid non-metallic conduit may be used up to first outlet box, provided outlet box is at a maximum height of 48" above finished floor.
      b) Where penetrating a floor in location other then that above use a black mastic coated or PVC coated galvanized rigid steel conduit.

D. Outdoor Location:
   1. Above Grade:
      a) Where penetrating the finished grade, black mastic coated or PVC coated galvanized rigid steel conduit shall be used.
      b) In general all exterior conduit runs shall be rigid conduit (with PVC coating if within 10 miles of ocean or gulf) and threaded connectors as specified elsewhere.
      c) Electrical metallic tubing (thin wall) is permitted under roof, overhangs, etc. provided it is not subjected to physical damage and is not in direct contact or directly subject to exterior elements including sunlight.
      d) Exterior conduits not on roof and not subject to damage (i.e. 6' above grade/floor or higher) may be rigid non-metallic PVC conduit as specified elsewhere. (Schedule 40 for low voltage Class II wiring, Schedule 80 for power wiring.)
      e) Exterior conduits from grade level to 6' above grade may be rigid non-metallic Schedule 40 PVC for low voltage Class II wiring provided rigid metal conduit is used at transition from below grade to 12" above grade (due to weed eater damage, etc.).
   2. Metal Canopies:
      a) Conduit runs except for canopy lighting raceways are not to be run on (top or bottom) of metal canopies roof systems. All new conduit shown on or at these areas shall be run underground.
   3. Roofs:
      a) Conduit is not to be installed on roofs, without written authorization by A/E for specific conditions.
      b) When accepted by written authorization conduit shall comply with the following:
         1. Be PVC coated rigid galvanized metal conduit.
         2. All fittings, etc. are to be PVC coated.
         3. Conduit shall be supported above roof at least 6" using accepted conduit supporting devices. Refer to applicable sections of specifications on roofing, etc.
         4. Supports to be fastened to roof using roofing adhesive or means as accepted by roofing contractor.

E. Interior Dry Locations:
   1. Concealed: Use rigid metal conduit or aluminum conduit, intermediate metal conduit, electrical metallic tubing. Rigid non-metallic conduit may be used inside block walls up to first outlet to a maximum of 40" AFF except where prohibited by the NEC (places of assembly, etc.).
   2. Exposed: Use rigid metal conduit or intermediate metal conduit, electrical metallic tubing. EMT may only be used where not subject to damage, which is interpreted by this

specification to be above 90" AFF.

3. Concealed or exposed flexible conduit:

a) Concealed flexible steel conduit or seal tight flexible steel conduit in lengths not longer than 6' in length with a ground conductor installed in the conduit or an equipment ground conductor firmly attached to the terminating fitting at the extreme end of the flex. Exposed flexible steel conduit or seal tight flexible steel conduit shall not exceed 2' in length, unless written authorization by A/E for specific conditions is granted.

F. Interior Wet and Damp Locations:

1. Use rigid galvanized steel or intermediate metal conduit.

G. Concrete Columns or Poured in-place Concrete Wall Locations:

1. Use rigid non-metallic conduit. Penetration shall be by accepted metal raceway (i.e. metal conduit as required elsewhere in these specifications).

H. Locations Near 400 Hz Distribution Systems:

1. Metal ferrous conduit or support equipment is not to be installed within 6" of any 400 Hz distribution system conduit or wire. Increase distance if so required by 400 Hz system manufacturer.

3.2 ADDITIONAL REQUIREMENTS FOR RIGID STEEL CONDUIT

A. Rigid steel conduit shall be cut and threaded with tools accepted for the purpose and by qualified personnel.

1. Accepted pipe vise.

2. Roller/bade type cutter or band saw.

3. Reamer capable of completely removing all ridges or burrs left by the cutter. Reaming with pliers is not acceptable.

B. Hangers shall be installed 8' apart.

C. Conduits stubbed through floor slabs, above grade and not contained inside walls, shall be rigid galvanized metallic conduit.

3.3 ADDITIONAL REQUIREMENTS FOR EMT

A. Electrical metallic tubing (thin wall) may be installed inside buildings above ground floor where not subject to mechanical injury.

B. All cuts shall be reamed smooth and free of sharp and abrasive areas by use of an accepted reamer.

3.4 ADDITIONAL REQUIREMENTS FOR ALUMINUM CONDUIT

A. May be used only for 400 Hz electrical distribution system.

3.5 ADDITIONAL REQUIREMENTS FOR FLEXIBLE STEEL CONDUIT AND SEAL-TITE FLEXIBLE STEEL CONDUIT

A. Shall be properly grounded.

B. Shall be installed with accepted fittings.

3.6 ADDITIONAL REQUIREMENTS FOR RIGID NON-METALLIC CONDUIT (PVC CONDUIT)

A. Rigid non-metallic PVC conduit is not allowed anywhere inside building(s) except underground, in slab, in poured in place concrete, and in block wall up to first outlet box (if not over 40" AFF) if

allowed by codes. Rigid non-metallic PVC conduit may be used exterior to building as stated elsewhere in these specifications.

B. Join rigid non-metallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

C. Threads will not be permitted on rigid non-metallic PVC conduit and fittings, except for rigid steel to rigid non-metallic PVC couplings.

D. Installation of rigid non-metallic PVC conduit shall be in accordance with manufacturer's recommendations.

E. Rigid non-metallic PVC conduit shall not be used to support fixture or equipment.

F. Field bends shall be made with accepted hotbox. Heating with flame and hand held dryers are prohibited.

3.7 SUPPORTS

A. Arrange supports to prevent misalignment during wiring installation.

B. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

C. Group related conduits; support using conduit rack. Construct rack using steel channel; (minimum 24” increase distance as required) provide space on each for 25 percent additional conduits.

D. Fasten conduit supports to building structure and surfaces under provisions of Section 16190 Hangers and Supports.

E. Do not support conduit with wire, metal banding material, or perforated pipe straps. Remove wire used for temporary supports

F. Do not attach conduit to ceiling support wires.

G. Conduits shall not be supported from ceiling grid supports, plumbing pipes, duct systems, heating or air conditioning pipes, or other building systems.

H. Non-bolted conduit clamps, as manufactured Caddy Corp. are not accepted. Supporting conduit and boxes with wire is not accepted. All raceways except those from surface-mounted switches, outlet boxes or panels shall be supported with clamp fasteners with toggle bolt on hollow walls, and with lead expansion shields on masonry.

3.8 EXPANSION FITTINGS

A. Provide expansion fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.

B. Expansion fittings shall be installed in the following cases: In each conduit run wherever it crosses an expansion joint in the concrete structure; on one side of joint with its sliding sleeve end flush with joint, and with a length of bonding jumper in expansion equal to at least three times the normal width of joints; in each conduit run which mechanically attached to separate structures to relieve strain caused by shift on one structure in relation to the other; in straight conduit run above ground which is more than 100’ long and interval between expansion fittings in such runs shall not be greater than 100’.

3.9 GROUNDING

A. All raceways shall have a copper system ground conductor throughout the entire length of circuit installed within conduit in strict accordance with NEC codes.

B. Grounding conductor shall be included in total conduit fill determining conduit sizes, even though

not included or shown on Drawings.

C. Grounding conductors run with exterior/ underground feeders shall be bare only.

D. Grounding conductors run with feeders shall be bonded to portions of conduit that are metal by accepted ground bushings.

E. See other sections of these specifications for additional requirements.

F. Grounding conductors (including lightning protection down conductors) run in metal conduit shall be bonded to metal conduit at both ends.

3.10 FIRE AND SMOKE STOPPING

A. Contractor is to provide fire stopping and/or smoke stopping for all penetrations of existing (or new if applicable) fire or smoke barrier walls, chases, floors, etc. as required to maintain existing rating of floor, wall, chase, etc.

B. Install conduit to preserve fire resistance rating of partitions and other elements.

C. Install fireproofing material to maintain existing rating of floor, beams, etc. damaged or removed by renovation.

D. Fire and smoke stopping material: A two-part silicone foam or a one-part putty, UL classified and FM accepted with flame spread of 0 and smoke development not to exceed 50 in accordance with ASTM E84. Material shall be suitable for penetration seals through fire-rated floors and walls when tested in accord with ASTM E119. Material shall not melt or soften at high temperatures, shall be suitable for direct outdoor and ultraviolet exposures, shall cure to give a tight compression fit, and shall not produce toxic fumes. Material, when heated, shall expand to fill and hold penetration closed where burn out of cable insulation or ATC tubing occurs.

3.11 VERTICAL RACEWAYS

A. Cables in vertical raceways shall be supported per NEC 300-19. Provide and install supporting devices for cables, including any necessary accessible pullbox as required regardless if shown on Drawings or not. Provide and install access panels as required. Coordinate location of pull box and access panel with architect prior to installation. This includes empty raceways for future use.

3.12 GENERAL

A. Install conduit in accordance with NECA Standard Practice of Good Workmanship in Electrical Contracting. Contractor shall layout all work prior to rough-in.

B. Install nonmetallic conduit in accordance with manufacturer’s instructions.

C. Arrange conduit to maintain headroom and present neat appearance.

D. Route conduit installed above accessible ceilings or exposed to view parallel or perpendicular to walls. Do not run from point to point.

E. Route conduit in and under slab from point-to-point.

F. Do not cross conduits in slab.

G. Maintain adequate clearance between conduit and piping.

H. Maintain 12” clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).

I. Cut conduit square using saw or pipe cutter; de-burr cut ends.

J. Bring conduit to shoulder of fittings; fasten securely.

K. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast

boxes.

L. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2" size.

M. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

N. Provide and install pullboxes, junction boxes, fire barrier at fire rated walls etc., as required by NEC 300, whether shown on Drawings or not.

O. Provide continuous fiber polyline 1000 lb. minimum tensile strength pull string in each empty conduit except sleeves and nipples. This includes all raceways which do not have conductors furnished under this Division of the specifications. Pullcord must be fastened to prevent accidental removal.

P. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Q. Identify conduit under provisions of Section 16195 Identification for Electrical Systems.

R. Install all conduits concealed from view unless specifically shown otherwise on Drawings

S. Rigid steel box connections shall be made with double locknuts and bushings.

T. All raceways shall be kept clear of plumbing fixtures to facilitate future repair or replacement of said fixtures without disturbing wiring. Except where it is necessary for control purposes, all raceways shall be kept away from items producing heat.

U. All raceway runs in masonry shall be installed at the same time as the masonry so that no face cutting is required, except to accommodate boxes.

V. All raceways shall be run from outlet to outlet as shown on the Drawings, unless permission is granted to alter arrangement shown. If permission is granted arrangement shall be marked on field set of Drawings as previously specified.

W. Spare conduit stubs shall be capped and location and use marked with concrete marker set flush with finish grade. Marker shall be 6" round x 6" deep with appropriate symbol embedded into top to indicate use. Also, tag conduits in panels where originating.

X. All conduit stubbed above floor shall be strapped to Kindorf channel supported by conduit driven into ground or tied to steel. Spare conduit stubs shall be capped with a UL listed and accepted cap or plug for the specific intended use and identified with ink markers as to source and labeled "Spare."

Y. Provide conduit seal-offs wherever conduit crosses obvious temperature changes (i.e. from inside to outside of coolers, freezers, etc.).

Z. Route conduit through roof openings for piping and ductwork or through suitable roof flashing or boot. Coordinate location with roofing installation specified under other sections of these Specifications.

AA. All raceways shall be run in neat and workmanlike manner and shall be properly in accordance with latest edition of NEC with accepted conduit clamps, hanger rods and structural fasteners.

BB. All raceway runs, whether terminated in boxes or not, shall be capped during the course of construction and until wires are pulled in, and covers are in place. No conductors shall be pulled into raceways until construction work which might damage the raceways has been completed.

CC. Electrical raceways shall be supported independently of all other systems and supports, and shall in every case avoid proximity to other systems which might cause confusion with such systems or might provide a chance of electrolytic actions, contact with live parts or excessive induced heat.

END OF SECTION

SECTION 16112
SURFACE RACEWAYS

PART 1 - GENERAL

1.1 DESCRIPTION OF SYSTEM

A. Provide and install all equipment, labor, material, accessories, and mounting hardware for a complete and operating system for the following:

1. Surface metal raceways.
2. Multi-outlet assemblies.
3. Wireways.
4. Wall duct.

1.2 REFERENCES

A. NECA (National Electrical Contractor's Association) Standard of Installation.

B. NEMA WD 6 - Wiring Device Configurations.

1.3 SUBMITTALS

A. Submit under provisions of the General Requirements of the Contract Documents and Section 16012.

B. Submit Product Data: Provide dimensions, knockout sizes and locations, materials, fabrication details, finishes, and accessories.

C. Submit Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum five years experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 SURFACE METAL RACEWAY WITH DUPLEX RECEPTACLES AND (WHERE APPLICABLE) COMMUNICATION SYSTEMS OUTLET

A. Manufacturers:

1. Single Duct:
   a) Wiremold #G3000 Series.
2. Twin Duct:
   a) Wiremold #G-4000 Series.

B. Description:

1. Single, double, or triple metal raceway system with cover, devices and device covers.
2. Two-piece construction (base and snap-on cap).

C. Size:

1. Single: 2.83 sq. in., 1 5/8" x 2 1/8".
2. Double: (2) 2.83 sq. in., 1 5/8" x 4 1/4".

D. Finish: Gray enamel base. Paint as directed by architect.

E. Fittings: Provide all fittings as required for a complete and enclosed system, including but not limited to:

1. Wall box connector (for flush end feeder).
2. End feed (for surface conduit connections).
3. Panel connector (for connecting to panels, cabinets, etc.)
4. End blanks.
5. T's, couplings, elbows, bridges, etc.

F. Device and Device Covers:

1. Provide and install power receptacles as noted on drawings complete with covers.
2. Provide and install cover with grommetted hole for communication systems outlets shown on drawings.

G. Wiring Devices:

1. Power receptacles are to be minimum 20 amp, 120V spec. grade equal or superior to that specified in wiring device section (gray).

2.2 WIREWAY

A. Manufacturers:

1. Hoffman.
2. Square "D"
3. Electrical Enclosures
4. Substitutions: Under provisions of Section 16013.

B. Description: General purpose, Oiltight and dusttight or Raintight type wireway as indicated on drawings. If not indicated provide type required to meet applicable codes.

C. Knockouts: Manufacturer's standard.

D. Size: As indicated on Drawings, or larger as required by the N.E.C.

E. Cover: Hinged cover with full gasketing for raintight and oiltight types.

F. Connector: Slip-in for general purpose and raintight types and flanged for oiltight types.

G. Fittings: Lay-in type with removable top, bottom, and side; captive screws for general purpose, and drip shield for raintight type, and removable top for oiltight type.

H. Finish: Rust inhibiting primer coating with gray enamel finish.

PART 3- EXECUTION

3.1 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Use flat-head screws, clips, and straps to fasten raceway channel to surfaces. Mount plumb and level.

C. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

D. Wireway Supports: Provide steel channel as specified in Section 16190.

E. Close ends of wireway and unused conduit openings.

F. Ground and bond raceway and wireway under provisions of Section 16170.

G. Install only in locations deemed accessible by the NEC and local authority. Provide all access panels, etc.,as required to maintain required access.

END OF SECTION

SECTION 16131
OUTLET BOXES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes wall and ceiling outlet boxes (and/or small junction/pullboxes).

B. Provide and install all outlet boxes (flush or surface) complete with all accessories as required to facilitate installation of electrical system and as required by the NEC.

1.3 REFERENCES

A. ANSI/NEMA FB 1 Fittings Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable

B. ANSI/NEMA OS 1 Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports

C. ANSI/NFPA 70 National Electrical Code

D. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories as suitable for purpose specified and shown.

1.5 DESCRIPTION

1.6 SUBMITTALS

A. Submit catalog cut sheets/product data on:

1. Surface cast boxes.

B. For pullboxes and junction boxes not covered in Section 16133 Pull and Junction Boxes, submit product data showing dimensions, covers, and construction.

1.7 PROJECT CONDITIONS

A. Verify field measurements are as shown on Drawings.

B. Verify locations of outlets in offices and work areas prior to rough-in.

C. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose.

PART 2 - PRODUCTS

2.1 GENERAL

A. All boxes and fittings shall be labeled by Underwriters Laboratories.

B. Provide box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, outlet boxes, and corrosion-resistant knockout closures compatible with outlet boxes being used and meeting requirements of individual wiring situations.

C. All boxes shall be of the size and shape required by NFPA 70 for their respective locations.

D. Boxes shall be of such form and dimensions as to be adapted to the specific use and location, type of device or fixtures to be used, and number and size of conductors and arrangement, size and number of conduits connecting thereto.

E. Handy boxes shall not be used.

F. Outlet boxes to be one-piece.

G. 4" x 4" boxes and 4 11/16" x 4 11/16" boxes used as junction boxes shall be one piece.

2.2 SHEET METAL OUTLET BOXES ANSI/NEMA OS 1, GALVANIZED STEEL:

A. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2” male fixture studs where required.

B. Concrete Ceiling Boxes: Concrete type.

C. Interior flush outlet boxes shall be galvanized steel constructed with stamped knockouts in back and sides, and threaded holes with screws for securing box coverplates or wiring devices. T&B, Steel City, Raco or accepted substitution.

D. Ceiling outlet boxes shall be 4" octagonal or 4" square X 1-1/2" deep or larger as required for number and size of conductors and arrangement, size and number of conduits terminating at them.

E. Switch, wall receptacle, telephone and other recessed wall outlet boxes in drywall shall be 4" square X 1-1/2" deep. For recessing in exposed masonry, provide one piece 4" square x 1-1/2" deep wall boxes with appropriate 4" square cut tile wall covers Steel City series #52-C-49/52-C-52 or accepted substitution. For recessing in furred-out block walls, provide 4" square box with required extension for block depth and required extension for drywall depth.

2.3 CAST BOXES NEMA FB 1:

A. Interior surface outlet boxes and conduit bodies installed from 0" AFF to 90" AFF (including fire alarm device backbox) shall be the heavy cast aluminum or iron with external threaded hubs for power devices and threaded parts for low voltage devices; Appleton, Crouse Hinds or accepted substitution. Trim rings shall also be of one-piece construction.

B. Weatherproof outlet boxes shall be constructed of corrosion-resistant cast metal suited to each application and having threaded conduit hubs, cast metal faceplate with spring-hinged waterproof cap suitably configured, gasket, and corrosion-proof fasteners.

C. Boxes to be Type FD unless otherwise noted on drawings.

D. Freestanding cast boxes are to be type FSY (with flange). Other cast zinc boxes are not acceptable.

PART 3 - EXECUTION

3.1 GENERAL

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

C. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6” from ceiling access panel or from removable recessed luminaire.

D. Install boxes to preserve fire resistance rating of partitions and other elements.

E. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

F. Use flush mounting outlet boxes in finished areas.

G. Do not install flush mounting boxes back-to-back in walls; provide minimum 6” separation. Provide minimum 24” separation in acoustic rated walls.

H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

I. Use stamped steel bridges to fasten flush mounting outlet box between studs.

J. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

K. Support all outlet boxes from structure with minimum of one 3/8" all-thread rod hangers. Boxes larger than 25 square inches shall be supported with two all-thread rod hangers, minimum.

L. Do not fasten boxes to ceiling support wires.

M. Support boxes independently of conduit.

N. Use gang box where more than one device is mounted together. Do not use sectional box.

O. Use gang box with plaster ring for single device outlets.

P. Use cast outlet box in exterior locations and wet locations.

Q. Comply with applicable portions of the NECA National Electrical Installation Standards.

R. Install outlets in the locations shown on the drawings; however prior to rough-in, the Owner shall have the right to make slight changes in locations to reflect room furniture layouts.

S. The Contractor shall coordinate his work with that of the General Contractor so that each electrical box is the type suitable for the wall or ceiling construction provided and suitable fireproofing is inbuilt into fire rated walls.

T. The Contractor shall relocate electrical boxes as required so that once installed, electrical devices will be symmetrically located with respect to the room layout.

U. All boxes shall be installed in a flush rigid manner with box lines at perpendicular and parallel angles to finished surfaces. Boxes shall be supported by appropriate hardware selected for the type of surface from which the box shall be supported. For example, provide metal screws for metal, wood screws for wood, and expansion devices for masonry or concrete.

V. For locations exposed to weather or moisture (interior or exterior), provide weatherproof boxes and accessories.

W. As a minimum, provide pull boxes in all raceways over 150’. The pull box shall be located near the midpoint of the raceway length.

X. Provide knockout closures to cap unused knockout holes where blanks have been removed, and plugs for unused threaded hubs.

Y. Provide conduit locknuts and bushings of the type and size to suit each respective use and installation.

Z. Boxes and conduit bodies shall be located so that all electrical wiring is accessible.

AA. Avoid using round boxes where conduit must enter box through side of box, which would result in a difficult and insecure connection with a locknut or bushing on the rounded surface.

BB. All flush outlets shall be mounted so that covers and plates will finish flush with finished surfaces without the use of shims, mats or other devices not submitted or accepted for the purpose. Add-a-Depth rings or switch box extension rings (Steel City #SBEX) are not acceptable. Plates shall not support wiring devices. Gang switches with common plate where two or more are indicated in the same location. Wall-mounted devices of different systems (switches, thermostats, etc.) shall be coordinated for symmetry when located near each other on the same wall. Outlets on each side of walls shall have separate boxes. Through-wall type boxes shall not be permitted.

Back-to-back mounting shall not be permitted. Trim rings shall be extended to within 1/8" of finish wall surface.

CC. Outlet boxes mounted in metal stud walls are to be supported to studs with two screws inside of outlet box to a horizontal stud brace between vertical studs or one side of outlet box supported to stud with opposite side mounted to section of stud or device to prevent movement of outlet box after wall is finished.

DD. All outlet boxes that do not receive devices in this Contract are to have blank plates installed matching wiring device plates.

EE. Mount Height:

1. Height of wall outlets to bottom above finished floors shall be as follows, unless specifically noted otherwise, or unless otherwise required by applicable codes including ADA. Verify with the Architectural Drawings and Shop Drawings for installing:

Switches	4'-0" AFF to top
Receptacles	1'-4" AFF to bottom
Fire Alarm Pull Stations	4'-0" AFF to top
Fire Alarm Strobe Lights	80" AFF to bottom

2. Bottoms of outlets above countertops or base cabinets shall be minimum 2" above countertop or backsplash, whichever is highest. Outlets may be raised so that bottom rests on top of concrete block course, but all outlets above counters in same area shall be at same height. It is the responsibility of this Division to secure cabinet drawings and coordinate outlet locations in relation to all cabinets as shown on Architectural Drawings, prior to rough-in, regardless of height shown on Division 16 Drawings.

3. Height of wall-mounted fixtures shall be as shown on the drawings or as required by Architectural Drawings and conditions. Fixture outlet boxes shall be equipped with fixture studs when supporting fixtures.

FF. Special Purpose Outlets:

1. Locate special purpose outlets as indicated on the Drawings for the equipment served. Location and type of outlets shall be coordinated with appropriate trades involved. The securing of complete information for proper electrical roughing-in shall be included as work required under this Section of Specifications. Provide plug for each outlet.

GG. Outlets in Fire/Smoke and Smoke Partitions/Walls:

1. Electrical outlet boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings occur on one side only in each framing space and that openings do not exceed 16 square inches. All clearances between such outlet boxes and the gypsum board must be completely filled with joint compound or other accepted materials. The wall must be built around outlets of larger size so as not to interfere with the integrity of the wall rating.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Coordinate installation of outlet box for products furnished under all Sections of these Specifications.

B. Coordinate locations and sizes of required access doors with applicable Sections in these Specifications.

C. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

D. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.

E. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

3.3 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closure in unused box opening.

END OF SECTION

SECTION 16133
PULL AND JUNCTION BOXES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Provide and install pull and junction boxes as shown on Drawings or as required by the NEC.

B. Provide and install pull and junction boxes wherever required for a complete and operating distribution system whether shown on Drawings or not.

C. Where outlet boxes are used for pull and/or junction boxes, they shall meet the requirements of Section 16131 Outlet Boxes.

1.3 REFERENCES

A. ANSI/NEMA FB 1 Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable

B. ANSI/NEMA OS 1 Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports

C. ANSI/NEMA OS 2 Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports

D. ANSI/NFPA 70 National Electrical Code

E. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories as suitable for purpose specified and shown.

1.5 SUBMITTALS

A. Submit actual shop drawings on all pull boxes showing.

1. Covers.

2. Dimensions - inside and out.

3. Rating of concrete or gauge of metal.

4. Manufacturer.

1.6 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations and mounting heights of pull and junction boxes.

1.7 PROJECT CONDITIONS

A. Verify field measurements are as shown on Drawings.

B. Verify locations of pull and junction boxes prior to rough-in.

C. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose and to maintain required access.

PART 2 - PRODUCTS

2.1 GENERAL

A. Dimensions of pull and junction boxes shall meet dimensions shown on Drawings or dimensions required by NEC, whichever is largest.

B. Pull and junction boxes shall meet all requirements of UL and NEC.

C. Small pull boxes (i.e. 4" x 4") shall meet the requirements of these Specifications for outlet boxes as a minimum.

D. All boxes (above ground) of 100 cubic inches or more shall be constructed of 14 gauge steel with hot dip galvanized coating.

PART 3- EXECUTION

3.1 GENERAL

A. Install per NEC

B. Install electrical boxes as shown on Drawings and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

C. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

E. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6” from ceiling access panel or from removable recessed luminaire.

F. Install boxes to preserve fire resistance rating of partitions and other elements.

G. Align adjacent wall-mounted boxes with each other.

H. Use flush mounting boxes in finished areas.

I. Do not install flush mounting boxes back-to-back in walls; provide minimum 6” separation. Provide minimum 24” separation in acoustic rated walls.

J. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

L. Pull and junction boxes larger than 25 square inches shall be supported with two 3/8" all-thread rod hangers minimum.

M. Install all labels and identification as required by the NEC and applicable sections of these Specifications.

N. Pull and junction boxes used for systems (Section 16700-16799) larger than 25 square inches shall be hinged cover type.

O. Do not fasten boxes to ceiling support wires.

P. Support boxes independently of conduit.

Q. Large Pull Boxes:

1. Boxes larger than 100 cubic inches in volume or 12” in any dimension.

a) Interior dry locations per NEC with screw covers.

2. Other locations use hinged enclosure under provisions of Section 16160 Cabinets and Enclosures.

R. Boxes Installed Outdoors: All boxes installed outdoors to be NEMA 4, fully weatherproof and watertight.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations and sizes of required access doors with applicable sections in these Specifications.

B. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

3.3 ADJUSTING

A. Install knockout closure in unused box opening.

END OF SECTION

SECTION 16190
HANGERS AND SUPPORTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Conduit and equipment supports.

2. Anchors and fasteners.

B. Furnish and install all supports, hangers and inserts required to mount fixtures, conduit, cables, pullboxes and other equipment furnished under this Division.

1.3 REFERENCES

A. NECA National Electrical Contractors Association

B. ANSI/NFPA 70 National Electrical Code

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Materials and Finishes: Provide corrosion resistance.

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide anchors, fasteners, and supports in accordance with NECA National Electrical Installation Standards.

C. Do not fasten supports to pipes, ducts, mechanical equipment or conduit.

D. Do not use spring steel clips and clamps.

E. Obtain permission from A/E before using powder-actuated anchors.

F. Obtain permission from A/E before drilling or cutting structural members.

G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

H. Install surface-mounted cabinets and panelboards with minimum of four anchors.

I. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1” off wall.

J. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

K. All items shall be supported from the structural portion of the building, except standard ceiling-mounted lighting fixtures, and small devices may be supported from ceiling system where permitted by Ceiling Contractor, however, no sagging of the ceiling will be permitted. Wire shall not be used as a support. Boxes and conduit shall not be supported or fastened to ceiling suspension wires or to ceiling channels.

L. This Contractor shall lay out and install his work in advance of the laying of floors or walls, and shall furnish and install all sleeves that may be required for openings through floors, wall, etc. Where plans call for conduit to be run exposed, this Contractor shall furnish and install all inserts and clamps for the supporting of conduit. If this Contractor does not properly install all sleeves and inserts required, he will be required to do the necessary cutting and patching later at his own expense to the satisfaction of the Architect.

M. All conduits shall be securely fastened in place per NEC. Hangers, supports or fastenings shall be provided at each elbow and at the end of each straight run terminating at a box or cabinet. The use of perforated iron for supporting conduits will not be permitted. The required strength of the supporting equipment and size and type of anchors shall be based on the combined weight of conduit, hanger and cables. Horizontal and vertical conduit runs may be supported by one-hole malleable straps, clamp-backs, or other accepted devices with suitable bolts, expansion shields (where needed) or beam-clamps for mounting to building structure or special brackets.

N. Where two or more conduits are run parallel or in a similar direction, they shall be grouped together and supported by means of Kindorf type trapeze hanger system (racking) consisting of concrete inserts, threaded solid rods, washers, nuts and galvanized "L" angle iron, or Unistrut cross members. These conduits shall be individually fastened to the cross member of every other trapeze hanger with galvanized cast one hole straps, clamp backs, bolted with proper size cadmium machine bolts, washers and nuts. If adjustable trapeze hangers are used to support groups of parallel conduits, U-bolt type clamps shall be used at the end of a conduit run and at each elbow. J-bolts, or accepted clamps, shall be installed on each third intermediate trapeze hanger to fasten each conduit.

O. Hanger assemblies shall be protected after fabrication by galvanizing. Hangers for PVC coated conduit shall be PVC coated galvanized conduit or stainless steel.

P. On concrete or brick construction, insert anchors shall be installed with round head machine screws. In wood construction, round head screws shall be used. An electric or hand drill shall be used for drilling holes for all inserts in brick, concrete or similar construction. In brick, inserts shall be near center of brick, not near edge or in joint. Where steel members occur, same shall be drilled and tapped, and round head machine screws shall be used. All screws, bolts, washers, etc., used for supporting conduit or outlets shall be fabricated from rust-resisting metal, or accepted substitution. Fasteners similar to "TAP-CON" self tapping power driven type are acceptable. Plastic anchors are not acceptable.

Q. Conduit supporting devices such as spring type conduit clips manufactured by Caddy Corporation may not be used.

R. Threaded rod hangers shall be galvanized continuous thread type, minimum 3/8" diameter.

S. Concrete/insert anchors, threaded rods, or similar fasteners installed on side or bottom of prestressed beams are not acceptable.

END OF SECTION

SECTION 16195
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Provide and install all equipment, labor and material for a complete identification system, including but not limited to:

1. Nameplates and labels.
2. Wire and cable markers.
3. Conduit markers.

B. Identify all new boxes, equipment, etc. as specified herein.

1.3 REFERENCES

A. ANSI/NFPA 70 National Electrical Code.

B. Americans with Disabilities Act

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2- PRODUCTS

2.1 NAMEPLATES

A. Nameplates shall be laminated phenolic plastic, chamfered edges.

1. 120/208 Volt System:
   a) Black front and back, white core, lettering etched through outer covering, white engraved letters on black background.
2. For 277/480 Volt System:
   a) Orange with white letters.
3. Emergency System:
   a) Red with white letters.

B. Letter Size:

1. 1/8” letters for identifying individual equipment and loads.
2. 1/4” letters for identifying grouped equipment and loads.

C. Nameplates shall adequately describe the function of the particular equipment involved. Where nameplates are detailed on the Drawings, inscription and size of letters shall be as shown and shop drawing submitted for acceptance. Nameplates for panelboards, switchboards, motor control centers, disconnects and enclosed breakers shall include the panel designation, voltage and phase of the supply. For example, "Panel A, 120/208V, 3-phase, 4-wire." In addition, provide phenolic label in panel to describe where the panel is fed from and location. For

D. The following items shall be equipped with nameplates:

1. All motors, motor starters, motor-control centers, pushbutton stations, control panels, time switches, disconnect switches, transformers, panelboards, circuit breakers (i.e., all 2-pole, 3-pole circuit breakers), contactors or relays in separate enclosures, power receptacles where the nominal voltage between any pair of contacts is greater than 150V, wall switches controlling outlets that are not located within sight of the controlling switch, high voltage boxes and cabinets, large electrical, and electrical systems (Systems Sections 16700 through 16799), junction and pull boxes (larger than 4-11/16"), terminal cabinets, terminal boards, and equipment racks. Nameplates shall also describe the associated panel and circuit number, if applicable.

2.2 WIRE MARKERS

A. Description: Cloth, tape, split sleeve or tubing type wire markers.

B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

C. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on Drawings including neutral conductor.

2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on shop drawings.

2.3 CONDUIT/JUNCTION BOX COLOR CODE

A. All conduit system junction boxes (except those subject to view in public areas) shall be color coded as listed below:

COLOR CODE FOR JUNCTION BOXES	KRYLON PAINT NUMBER
Fire Alarm	Popsicle Orange K02410

B. Conduit (not subject to public view) longer then 20’ shall be painted with above color paint band 20 ft. on center. Paint band shall be 4" in length, applied around entire conduit. Where conduit is parallel and on conduit racking, the paint bands shall be evenly aligned. Paint shall be neatly applied and uniform. Paint boxes and raceways prior to installation, or tape conduits and surrounding surfaces to avoid overspray. Paint overspray shall be removed.

C. Junction boxes and conduits located in public areas (areas that can be seen by the public) shall be painted to match surface to which it is attached. Provide written request to A/E for interpretation of those public areas which may be in question.

2.4 CONDUIT/JUNCTION BOX MARKER

A. All new and existing junction boxes/cover plates for power, lighting and systems (except those installed in public areas) shall adequately describe its associated panel and circuit reference number(s) within (i.e. ELRW-2, 4, 6), or systems within (i.e. fire alarm, intercom, etc.). Identification shall be neatly written by means of black permanent marker. Paint one-half of cover plate with appropriate color above, and one-half with associated panel/circuit or system as described above. Junction box cover plates located in public areas shall be identified with small phenolic labels securely attached. Label colors to be determined by A/E. Large pull/junction boxes (8" x 8" or larger) shall be color identified by painting the corners of box cover plate with

specified colors at 45 degree angles; phenolic labels as specified herein.

B. Identify conduit not installed in public areas with corresponding panel/circuit numbers or corresponding system type as described above. Spacing: 20 ft. on center adjacent to color identification bands.

2.5 UNDERGROUND WARNING TAPE

A. Description: Minimum 6” wide plastic tape, detectable type, with suitable warning legend describing buried lines. Systems conduits shall have orange colored tape. Power/lighting conduits shall have red colored tape.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

A. Install nameplate parallel to equipment lines.

B. Secure nameplate to equipment front using stainless steel pop rivets.

C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

D. Nameplates installed inside on dead front cover shall be self-adhesive tape. Do not drill or install screws in dead front.

E. Identify new conduit, junction boxes, and outlet boxes using field painting.

F. Identify new underground conduit using underground warning tape. Install a minimum of one tape per trench at 6” below finished grade. For trenches exceeding 24” in width, provide one tape per 24” of trench width spaced evenly over trench width.

G. Install wire markers at all new connections and terminations, and at existing connections and terminations modified or altered.

END OF SECTION

SECTION 16721
ADDRESSABLE FIRE ALARM/DETECTION SYSTEM (EXTENSION OF EXISTING)

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. The work described herein and on the drawings consists of all labor, materials, equipment, and services necessary and required to provide and test an extension of the existing automatic fire detection and alarm system. Any material not specifically mentioned in this specification or not shown on the drawings but required for proper performance and operation shall be provided.

B. The drawings and specifications herein comply to the best of the engineer's knowledge with all applicable codes at the time of design. However, it is this Contractor's responsibility to coordinate/verify (prior to bid) the requirements of the Authority Having Jurisdiction over this project and bring any discrepancies to the engineer's attention at least seven (7) days prior to bid. No changes in contract cost will be acceptable, after the bid, for work and/or equipment required to comply with the authority having jurisdiction.

C. The Contractor is advised that circuit routing for this system is not necessarily shown on the project drawings. The contractor shall provide and install all raceways, wiring and cabling required for a complete and fully functional system as intended by these specifications. All wiring and/or cabling shall be in conduit. Contractor shall provide and install a properly sized, flush mounted outlet box for every device. Contractor shall size and route raceways to accommodate the proper installation of the system cabling. T-Tapped cabling shall not be acceptable. In locations where raceway and/or conduit is not accessible after completion of the project, conduit shall be routed from device to device or fire rated access panels shall be installed to provide access to junction and pull boxes. Routing of raceway from device to device shall only be acceptable where the wiring scheme of the system, as recommended by the manufacturer, requires cable to pass from device to device. Contractor shall properly terminate each device according to the manufacturer’s recommendations. Provide and install firestopping where penetrations are made through rated walls and floors.

D. The Contractor shall provide and install the Fire Alarm system (including all equipment, wiring, etc.) in accordance with the Manufacturer’s recommendations.

1. Installation of devices shall be in accordance with the Manufacturer’s requirements as well as the requirements of the Contract Documents. Recommendations by the Manufacturer for the proper installation of the Fire Alarm system and its equipment shall not preclude the requirement for the Contractor to comply with the requirements of the Contract Documents.

2. Termination of Fire Alarm circuits shall be in accordance with the Manufacturer’s recommendations, applicable requirements of the National Electrical Code (NFPA 70), ADA, other applicable Codes and the Contract Documents.

3. The Fire Alarm Installer shall be responsible for ensuring that prior to bidding the project the Electrical Contractor understands the raceway requirements for the project. Claims by the Contractor after award of the project in regard to additional raceway required either by the Fire Alarm System Manufacturer’s recommendations for proper installation of the system and its associated equipment, or for compliance with the requirements of the Contract Documents, shall not be allowed.

4. The Contractor shall be responsible for providing personnel necessary to accomplish either a fire watch and/or a security watch in unprotected areas during times when the fire alarm system is off-line.

    a) Where the fire alarm system is inactive in any area due to the work of this project, the contractor shall, as a minimum, provide personnel necessary to observe the status of each fire alarm control panel in the affected area.

    b) When security functions provided by the fire alarm system are off-line in any area or partial area, the Contractor shall, as a minimum, provide one person at each AOA door until the system is operational. during those times where the off-line time is accidental, the contractor shall station personnel within five (5) minutes of the system going off-line.

E. This specification describes a fully addressable, common fire alarm system with remote power supplies.

1. All components shall be connected via the Signaling Line Circuit (SLC) to the FACP.
2. The installation includes the phasing in of new equipment, and/or conduits and temporary wiring, if required, for the existing system in areas of demolition, and then removal of the existing system.
3. Any existing conduit that is in place, in good condition and meets this specification may be reused.
4. All new components must be electrically compatible with the existing FACP and must be interconnected by means of suitable wiring circuits to form a complete functional system when the project is completed.
5. Existing system must remain active at all times. Provide Fire Watch if system is taken off line at any location as required by applicable codes and the local Authority Having Jurisdiction.

1.3 DESCRIPTION

A. The Contractor shall furnish and install an addressable fire alarm system extension to match the existing system. The existing system is a Silent Knight System. All devices shall be addressable. Control shall be microprocessor based and field-programmable. All electronics shall be solid state.

B. Provide all materials, work, labor, etc. as required to modify (including any programming, battery capacity, etc.) the existing to comply with the operation, etc. noted in these contract documents.

C. The system extension shall include but not be limited to:

1. Main Fire Alarm Control Panel (FACP) including all required power supplies
2. Fire Alarm Annunciator Panel (FAAP)
3. Duct Detectors
4. Remote Power Supplies (Remote power supplies shall be in a UL Listed assembly and be provided by the same manufacturer as the Fire Alarm Control Panel (FACP)).
5. “Do not use elevator" warning lights
6. UL Listed Dialer
7. Surge Suppression
8. Programming
9. Grounding

10. Firestopping
11. Wire and Cable Labeling
12. Electrical power required to comply with all functions and operations called for in this section of the specifications.
13. Conduit, wire, wire fittings, terminal cabinets with plywood and terminal strips, and all accessories required to provide a complete operating system.

D. The contractor shall furnish and install all equipment (raceways, wire/cable, circuit breakers, modules, relays, etc.) necessary, and as required by applicable code, to accomplish incidental functions of the fire alarm system including but not limited to the following:

1. HVAC system control and/or shutdown
2. Ventilation system (supply fans, exhaust fans, fan terminal boxes, etc.) control and/or shutdown
3. Smoke control system control and/or shutdown
4. Control of fire, smoke, and/or combination fire/smoke dampers
5. Control of fire and/or smoke doors, dampers, shutters, etc.
6. Computer room power panels and air conditioning control and/or shutdown
7. Connection to telephone tie lines, UL Listed dialer, etc. required for monitoring of the fire alarm system

E. The system shall operate as a non-coded, continuous ringing system, which will sound all audible devices and activate all visual devices until it is manually silenced.

F. The system shall be wired as a Class B system for all circuits.

G. The system is to be a complete analog addressable system.

H. All portions of fire alarm system shall be installed in conduit. Conduit and boxes to be installed by electrical contractor.

I. The fire alarm system shall not share a raceway, junction box, enclosure, manhole or device with any other system.

J. Contractor to advise Owner of requirements for monitoring the fire alarm system by Owner's monitoring company and provide all electrical required for remote monitoring including tie to security cabinet.

K. Provide and install wiring, equipment, etc. for connection to devices furnished under other divisions of the work.

L. Provide and install wiring, equipment, etc. as required to deactivate power in the elevator rooms by heat detectors via shunt trip breakers and arm sprinkler pre-action system.

M. Provide and install wiring, equipment, etc. as required to deactivate power air conditioning equipment by automatic or manual devices as shown on plans.

N. Although they may not be indicated on the Fire Alarm system diagram and/or drawings, all required control and interlock wiring between the Fire Alarm system and building equipment shall be provided hereunder, Controls are required to/for/from:

1. Fire/smoke air and duct detectors
2. Fire, smoke and/or combination fire/smoke dampers
3. Supply/return fans, exhaust fans, and/or fan terminal boxes (FTB)

4. Automatic fire extinguishing systems
5. Smoke evacuation equipment
6. Sprinkler and/or Fire Protection system components

O. Provide and install all relays (electric-electric, electric-pneumatic, and/or pneumatic-electric) as required for a complete and operational fire alarm system, complying with all applicable codes and all requirements, and coordinated with all divisions of these specifications.

P. Provide terminal cabinets sized to house terminal strips and surge suppression equipment.

Q. Surge Suppression

1. The Contractor shall have equipment installed on the AC voltage supply and other lines taking care to arrest damaging electrical transient and spikes, which can cause damage to the microprocessor components of the system. Central office telephone lines shall have equipment installed to arrest high voltages from electrical and/or lightning from entering the system and causing damage.
2. Provide and install all materials, labor and auxiliaries required to furnish and install complete surge suppression for the protection of building fire alarm system from the effects of induced transient voltage surge and lightning discharge as indicated on drawings or specified in this section.
3. Provide surge suppression equipment at the following locations:
   a) On each conductor pair and cable sheath entering or leaving a building.
   b) On each conductor associated with fire protection (sprinkler) system fire alarm connections.
   c) In other locations where equipment sensitivity to surges and transients requires additional protection beyond that inherent to the design of the equipment. Where equipment being protected has internal surge suppression equipment, the surge protection equipment herein specified is required to be installed in addition to internal equipment protection.

1.4 STANDARDS, CODES, REFERENCES, AND REGULATORY REQUIREMENTS

A. Reference Section 16014.

B. The equipment and installation shall comply with the current or applicable provisions of the following standards:

1. ANSI S3.41 American National Standard Audible Emergency Evacuation Signal
2. National Fire Protection Association Standards:
   a) NFPA 70 National Electrical Code (including but not limited to Article 760, Fire Alarm Systems)
   b) NFPA 72 National Fire Alarm Code
   c) NFPA 101 Life Safety Code
   d) NFPA 90A Installation of Air Conditioning and Ventilating Systems
3. Underwriters Laboratories Inc. The system and all components shall be listed by Underwriters Laboratories Inc. for use in fire protective signaling system under the following standards as applicable:
   a) UL 864 (Category UOJZ) APOU Control Units and Accessories for Fire Alarm Systems. All Control Equipment shall be listed under UL category UOJZ.

b) UL 268 Smoke Detectors for Fire Alarm Systems

c) UL 268A Smoke Detectors for Duct Application

d) UL 217 Smoke Detectors Single and Multiple Station Smoke Alarms

e) UL 521 Heat Detectors for Fire Protective Signaling Systems

f) UL 228 Door Closers With or Without Integral Smoke Detectors

g) UL 464 Audible Signal Appliances

h) UL 1638 Visual Signaling Appliances

i) UL 1481 Power Supplies for Fire-Protective Signaling Systems

j) UL 1480 Speakers

k) UL 1424 Cables for Power-Limited Fire-Alarm Circuits

l) UL 1971 Signaling Devices for the Hearing Impaired

m) UL 1449 3rd Edition - Standard for Safety Surge Protective Devices

n) UL 497, UL 497A, UL 497B

4. All fire alarm equipment, including accessories to the system and including all wires and cable unless otherwise noted, shall be listed by the Underwriters' Laboratories product directory called Fire Protection Equipment and/or the Electrical Construction Materials List.

5. Each item of the fire alarm system shall be listed and classified by UL and FM as suitable for purpose specified and indicated.

6. The system controls shall be UL listed for Power Limited Applications per NEC. All circuits must be marked in accordance with NEC.

7. All equipment supplied as part of the Fire Alarm System shall be provided by a single manufacturer and shall comprise a complete UL Listed Fire Alarm System.

8. IEEE: The fire alarm system includes solid state electronic components. Therefore, the equipment manufacturer shall provide certification that all such equipment is internally protected from, or can withstand, power line surge voltages and currents as specified in Table 1, Location Category A High Exposure of ANSI/IEEE Standard C62.41-1991.

C. The equipment and installation shall comply with the current or applicable provisions of the following codes and laws:

1. Americans with Disabilities Act (ADA): The fire alarm system shall comply with ADA, Public Law 101-336, 1990. The system shall comply with ADA Accessibility Guidelines (ADAAG).

2. Federal Register - Rules and Regulations - Non-discrimination on the basis of Disability by Public Accommodations and in Commercial Facilities.

3. ASME/ANSI A17.1 – Safety Code for Elevators and Escalators (2004)

4. Local and State Building Codes.

a) Florida Administrative Code. All applicable chapters including but not limited to:

1. Chapter 69A Rules, including but not limited to:

(a) Ch 69A-3 Fire Prevention - General Provisions

(b) Ch 69A-43 (Florida Handicap Code - Lodging)

(c) Ch 69A-46 Fire Protection System Contractors and Systems

(d) Ch 69A-47 Uniform Fire Safety Standards for Elevators

(e) Ch 69A-48 Fire Safety Standards for the Fire Alarm Systems

b) Florida Department of Insurance:

1. Insurance Code: The fire alarm system and installation thereof shall comply with the State of Florida Department of Insurance rules. The requirements of the Florida State Department of Insurance shall be as promulgated by the Division of State Fire Marshal.

2. Fire Alarm Rules: The fire alarm system and installation thereof shall comply with the Fire Safety Rules promulgated by the Florida State Fire Marshal.

c) Authority Having Jurisdiction:

1. General: The system shall comply with all applicable Codes, Ordinances and Standards as interpreted and enforced by the local authority having jurisdiction.

2. Fire Department:

3. Building Official

4. State of Florida: Division of State Fire Marshal.

D. Surge Suppression

1. Equipment Certification: When available by any one manufacturer, all surge suppression equipment shall be listed by Underwriters Laboratories, shall bear the UL seal and be marked in accordance with referenced standard. Such surge suppression equipment shall be UL listed and labeled for intended use.

2. Comply with all standards and guides as listed under "References" above.

E. Systems not capable of complete network interface operations as described in this specification shall supply a complete local area or wide area network with CRT/terminals at each location and shall obtain UL site certification and acceptance prior to the completion date. Certification shall not delay final system acceptance.

1.5 RELATED SECTIONS

A. All applicable sections of Division 0, Division 1, and Division 16.

B. Applicable sections of these specifications with regard to, but not limited to:

1. Doors

2. Ductwork accessories: smoke dampers

3. Building control systems

1.6 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum ten (10) years experience and with service facilities within 50 miles of Project.

B. Installer:

1. Company specializing in installing the products specified in this section with minimum ten (10) years experience.

2. The Installer shall be currently licensed as a Florida Certified Alarm System Contractor I (EF).

3. The installing Contractor shall be a direct sales division of, or the authorized and designated distributor for, a fire alarm system manufacturer.

4. Installing Contractor shall maintain a local staff of specialists, including a Fire Alarm Planning Superintendent, for planning, installation, and service.
5. The installing Contractor shall maintain an office within fifty (50) miles of the project with capability to provide emergency service 7-days-a-week, 24 hour days. The installing Contractor shall have been actively engaged in the business of selling, installing and servicing fire alarm systems for at least ten (10) consecutive years going back from date of bid.

C. Surge Suppression

1. All surge suppression devices shall be manufactured by a company normally engaged in the design, development, and manufacture of such devices for electronics/communications systems equipment.
2. The surge suppressor manufacturer shall offer technical assistance through support by a factory representative and local stocking distributor.
3. Verify proper clearances, space, etc. is available for surge suppressor.

D. Coordination/Project Conditions

1. Verify proper grounding is in place.
2. In installations where the electrical contractor does not provide a counterpoise system in conjunction with the underground raceway system, the fire alarm contractor shall provide a coupling conductor within the fire alarm underground raceway system to run along side fire alarm conductors. Coupling conductors shall be sized according to applicable codes and standards.

E. The work specified herein is an extension of the existing system and as such all equipment shall match existing. In the event that the existing equipment is no longer available other equipment will be considered for acceptance provided the following is submitted in writing by the system installer to the engineer (See Section 16010 on Substitutions):

1. Certified letter from the manufacturer specifically stating the following:
   a) Part numbers and descriptions of each item that is no longer manufactured.
   b) Manufacturer name (if not the same as the original manufacturer), part numbers and descriptions of items that are certified by the manufacturer to be compatible with the existing system.
   c) A detailed listing of specific differences, including both advantages and disadvantages, between the original item and the proposed substitution.
2. Contractor qualifications (as listed above).
3. Complete lists, descriptions and drawings of materials to be used.
4. A complete drawing showing conduit, conduit sizes, backboxes, number of wires and wire sizes.
5. A complete riser diagram of Fire Alarm System.

1.7 SUBMITTALS

A. Submit in accordance with Sections 16010 and 16012.

B. In addition to requirements of 16010 and 16012, the contractor shall submit:

1. Narrative of operation of System as provided. (Submittal will not be reviewed by the A/E without this narrative.)
2. Manufacturer's data on all products, including but not limited to:

a) Catalog cut sheets.

b) Roughing-in diagrams.

c) Installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

d) Operation and maintenance manuals.

e) Typical wiring diagrams and risers.

f) The contractor shall submit test reports, manufacturers' specifications and any other information necessary to determine compliance with material and equipment specifications described herein.

3. Submit floor plans to locate all devices. Wiring diagrams shall include wire and raceway sizes, fire alarm control panels, riser wiring and associated raceway sizes, wiring details, connections and terminal identification. All devices shall be identified by the same applied identification symbol as shown on the contract documents.

4. Submit all load calculations and cable/wire sizing for each branch of the individual fire alarm field circuits. Wire sizing calculations to prove maximum three percent (3%) voltage drop at all AC voltages and maximum eight percent (8%) voltage drop at all DC voltages.

5. Battery sizing calculations.

6. Submit a detailed step by step testing procedure for a component by component system functional checkout and test.

7. Point to point wiring diagrams and block diagrams of system to be installed. Point to point wiring diagrams may be submitted at time of operation and maintenance manuals in lieu of in submittal brochure. Block diagrams shall be required with submittals.

8. Riser diagrams and floor plans showing conduit runs and number of wires. All devices shall be identified by the same applied identification symbol as shown on the drawings.

9. Surge Suppression

   a) Surge protective data for 120 volt power source, power circuit, outside signaling circuit, and exterior incoming circuits from other buildings (if any), and outgoing circuits to other buildings (if any).

   b) Submit Product Data for each type of suppressor:

      1. Dimensions

      2. Means of mounting

      3. Compliance with UL Standards referenced

      4. Compliance with IEEE Standards referenced

      5. Design type (Hybrid, MOV)

      6. Size of wire leads

      7. Warranty

      8. Performance data showing compliance with performance as specified herein.

      9. Complete schematic data on each suppressor type indicating component values, part number, conductor sizes, etc.

      10. Manufacturer's certified test data on each suppressor type.

11. Test data from an independent test laboratory.

10. Name, qualifications, etc. of company providing and installing system.
11. Qualifications of installer. Submit proof installer meets specified requirements.
12. Proof of UL Listing. Indicate the UL listing, the UL classification, and NEC insulation type used for each type of wire to be used in installation of fire alarm and communications system.
13. Manufacturer's drawings showing all dimensions (height, width, and depth) for all cabinets used to house system components. Provide catalog pages, mounting details and specification sheets for all fire alarm system components and rough-in boxes.
14. Submit Florida Registered Firm certificate number.
15. Submit Florida Fire Alarm Contractor's license number.
16. Submit Fire Alarm Technician(s) Manufacturer's certification.
17. Detail of Fire Department override control panel layout.
18. Detailed drawing of the Fire Alarm Control Panels layout indicating the exact arrangement of all zones, including expansion zones.
19. Coordination Drawing: Coordination CAD drawing of building Fire Command room and equipment layout as shown on drawings, with all panel and rack footprints, using actual manufacturer's dimensions, indicating proper clearances.
20. Network:
    a) Complete description data indicating UL listing for all network components.
    b) Complete sequence of operation of all functions of the network.
    c) A list of every network node address.
    d) A list of every address of every device connected to a network node that is provided for purposes of alarm initiation, status monitoring, supervised notification appliance circuits, and auxiliary control.
    e) Complete network wiring diagrams for all components and interfaces to equipment supplied by others.
21. All drawings required herein shall be on AutoCAD Release 2004 or higher.
22. Where required by Authority Having Jurisdiction submit signed and sealed documents as required by Authority Having Jurisdiction. Where Authority Having Jurisdiction requires shop drawings to be signed and sealed by a Registered Engineer, Contractor is required to submit same and include in his bid all costs associated with having a Registered Engineer other then the design Engineer of Record perform signing and sealing.

1.8 PROJECT RECORD DOCUMENTS

A. Submit in accordance with Sections 16010 and 16098.

B. In addition to the requirements of 16010 and 16098, the contractor shall submit:

1. Updated and revised contract documents to record actual locations (as-installed) of all equipment, devices, initiating devices, signaling appliances, and end-of-line devices.
2. Record actual type, size, and routing of cables installed.
3. Record all cable identifications.
4. Drawings required herein are in addition to those required under "OPERATION AND

MAINTENANCE DATA".

5. All drawings required herein to be on AutoCAD Release 2004 or higher.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit in accordance with Sections 16010 and 16098.

B. In addition to the requirements of 16010 and 16098, the contractor's O & M Manuals shall include:

1. A complete as-installed equipment list, listed by room, with manufacturers' names, model numbers, serial numbers, and quantities of each item.

2. A complete and correct system schematic, showing detailed connections for all parts of the system, including wire numbers, terminal block numbers and layouts, and other designations and codings (point-to-point wiring diagrams). System performance measurements shall be documented as noted elsewhere in this specification.

3. Riser diagrams showing as-installed conduit with pull boxes, outlet boxes, physical cable layouts, part numbers of cable types used, and number of circuits in each conduit.

4. Repair parts list for each and every major equipment item furnished.

5. Service manuals for each and every major equipment item furnished.

6. Manufacturer's warranties and operating instructions for each and every equipment item furnished. Include a copy of the certificate of warranty, signed by both parties.

7. Technical Systems Operations Manual, custom-written by the Contractor, for the purpose of instructing the Owner's operating personnel in the detailed step-by-step operation of the system and preventive maintenance procedures. This manual shall include descriptions of the system components and their relationship to system function. This manual shall be bound separately and labeled appropriately.

8. Surge Suppression

a) O & M data to include:

1. All accepted shop drawings, product data, and/or cutsheets.

2. Installation, connection, and maintenance information on each type of surge suppression.

3. Procedure and/or time table for recommended periodic inspection of devices to determine continued usefulness.

9. CAD floor plans, prepared at a scale of not less than 1/16" = 1'-0" showing detectors, speaker locations and orientation, rack locations, and all other related device locations.

10. The Contractor/Installer shall videotape the entire training session(s), and submit the video tape with the Operational Manual.

C. Drawings required herein are in addition to those required under "PROJECT RECORD DOCUMENTS".

1. All drawings required herein shall be on AutoCAD Release 2004 or higher.

1.10 WARRANTY

A. The contractor shall warrant the equipment to be new and free from defects in material and workmanship, and will, within one year from date of acceptance by owner, repair or replace any equipment found to be defective.

1. No charges shall be made by the installer for any labor, equipment, or transportation

during this period to maintain functions.

2. Respond to trouble call within twenty-four (24) hours after receipt of such a call.

B. The contractor shall guarantee all wiring and raceways to be free from inherent mechanical or electrical defects for one (1) year from date of final acceptance of the system.

C. Surge Suppression

1. All surge suppression devices shall be warranted free from defects in materials and workmanship for a period of five (5) years.

2. Any suppressor, which shows evidence of failure or incorrect operation during the warranty period, shall be repaired or replaced by the manufacturer and installer at no cost to the owner.

3. Equipment that is damaged by surges during warrantee period shall be replaced at no expense to Owner.

1.11 MAINTENANCE SERVICE

A. Furnish service and maintenance of fire alarm system for one (1) year from date of Substantial Completion.

1. No charge shall be made by the installer and/or contractor for any labor, equipment, or transportation during this period to maintain functions.

2. Respond to trouble call within twenty-four (24) hours after receipt of such call.

1.12 EXTRA MATERIALS

A. Provide six (6) keys of each type.

B. Provide three (3) of each type of automatic smoke detector without base.

C. Provide three (3) of each type of surge suppression device.

1.13 OWNER'S INSTRUCTION:

A. Provide instruction to the Owner's designated personnel upon completion of the system installation. Instruction shall include a functional training session on fire alarm control panel operation and instruction on peripheral device operation, including what are normal indications and alarm indications of each type of new/added device. Videotape all training sessions and deliver (4) copies of tapes to Owner (for use in future training).

1.14 SYSTEM OPERATION

A. System operation shall meet the operation requirements of all codes and regulatory requirements.

B. Upon activation of the Fire Alarm System by a manual station, smoke detector, or any other new or existing automatic device, (except AHU smoke duct detector) the following shall take place:

1. Energize all alarm signaling devices.

2. Sound all audible alarms and flash visual signals throughout the campus. (See Item 9 below)

3. Alert local fire department or proprietary system.

4. Cause alarm to be displayed on the annunciator section of the control panel.

5. Cause alarm to be displayed on remote annunciator

6. Close all doors or fire shutters, held open by automatic release devices throughout the facility, or by zone (coordinate with architect and door hardware supplier, provide all electrical required).
7. Unlock all electrically locked time-out room doors (coordinate with the architect and door hardware supplier, provide all electrical required).
8. Shut down all air handlers, exhaust fans supplying or exhausting air, and fan terminal boxes (FTB).
9. Shut down of air handling unit by a local smoke duct detector shall not activate audible alarms or flash visual signals, but shall provide a supervisory indication at the fire alarm control panel/fire alarm annunciator.
10. Shut all fire and/or smoke dampers in ducts associated with the air handling units and exhaust fans which are shut down.
11. Transmit signals to the building elevator control panel to initiate return to the main floor or alternate floor.
12. Transmit signals to the building automation system to tell system that the fire alarm system has taken control of respective mechanical system.
13. Send a signal to all dimming and lighting relay/control systems. Fire alarm signal shall initiate dimming system controls to drive all dimmed circuits to immediate full-on output. Fire alarm signal shall initiate lighting relay/control system to turn on all emergency lighting circuits.

C. System operation shall meet the operation requirements of all codes and regulatory requirements.

D. Upon activation of the Fire Alarm System by a manual station the following shall take place:

1. Energize all alarm signaling devices.
2. Sound all audible alarms and flash visual signals throughout the building.
3. Alert local fire department or proprietary system.
4. Cause alarm to be displayed on the annunciator section of the control panel.
5. Cause alarm to be displayed on remote annunciator
6. Close all doors, held open by automatic release devices throughout the facility, or by zone (coordinate with Architect and door hardware supplier, provide all electrical required).
7. Unlock all electrically locked doors (coordinate with architect and door hardware supplier, provide all electrical required).

E. Upon activation of the Fire Alarm System by any smoke detector, any sprinkler flow alarm switch or other automatic detection device, the following shall take place in addition to the above:

1. Shut down all air handlers and exhaust fans supplying or exhausting air in at least the zone where the alarm is initiated.
2. Shut all smoke dampers in ducts associated with the air handling units and exhaust fans, which are shut down, in at least the zone where the alarm is initiated. (Coordinate with mechanical contractor and provide all electrical as required).
3. Transmit signals to building elevator control panel to initiate return to main floor or alternate floor.
4. Transmit signals to building automation system to tell system that the fire alarm system has taken control of respective mechanical system.

5. Send a signal to all dimming and lighting relay/control systems. Fire alarm signal shall initiate dimming system controls to drive all dimmed circuits to immediate full-on output. Fire alarm signal shall initiate lighting relay/control system to turn on all emergency lighting circuits.

F. Elevator: Smoke detectors associated with elevator lobbies, hoistways and machine rooms shall be types accepted by the Florida State Fire Marshall under FAC Chapter 69A.47 Uniform Fire Safety Standards for Elevators. Elevator recall shall be initiated ONLY by elevator lobby, hoistways and machine room smoke detectors. In addition to those functions outlined in "A" above, elevator detector(s) shall initiate the following functions.

1. The operation of any one elevator lobby, hoistways, or machine room product of combustion detectors associated with a single bank of elevators shall signal the elevator controls to commence required procedures for that bank of elevators. Refer to Division 14 for required procedures, floor(s) of recall, and alternate floor(s) of recall.

2. The operation of any elevator machine room product of combustion detector that is part of this Fire Alarm System shall signal the elevator controls to commence required procedures for that bank of elevators. Refer to Division 14 for required procedures.

3. The activation of the smoke detector(s) in a machine room, lobby or hoistway shall cause a suitable warning light to flash. The light is to be located adjacent to the "Phase One" recall switch or elevator hall button at the designated and alternate fire department access level.

4. Fire alarm system shall monitor shunt trip voltage per NFPA 72.

G. System supervisory faults, such as shorts, opens, and grounds in conductors, operating power failure, or faults within supervised devices, shall place the system in the trouble mode, which causes the following system operations:

1. Visual and audible trouble signal indicated be zone at the fire alarm control panel.

2. Visual and audible trouble signal indicated at remote annunciator panel.

3. Trouble signal transmitted to central station.

4. Manual acknowledgement function at fire alarm control panel shall silence audible trouble signal; visual signal shall be displayed until initiating failure or circuit trouble is cleared.

H. Alarm Reset: The system shall remain in the alarm mode until manually reset with a key accessible reset function. The system shall reset only if the initiating circuits are cleared.

I. Lamp Test: manual lamp test function causes alarm indication at each lamp on the fire alarm control panel and the remote annunciator.

J. When the fire alarm system is activated as a drill, all incidental functions shall be exercised including notification of the fire department.

K. Where required by codes or authority having jurisdiction:

1. When system is silenced by silence switch in control panel, audible alarm is to silence but visual alarm devices are to continue to operate.

L. The fire sprinkler valve tamper switch, when closed, shall annunciate a supervision signal at the fire alarm control panel and annunciator panels, if any. This supervision signal shall not cause a general alarm.

M. Operation of auxiliary contacts in control panel to shut all smoke dampers in ducts associated with air handling units and exhaust fans which are shut down. (These shall not be controlled from detector unit contacts.)

1.15 ZONING

A. Alarm Zones.

1. Regardless of the number of zones shown on drawings, the minimum alarm zones required are:

a) One per building, per floor for pull stations.

b) One per building, per floor for automatic devices.

c) One for each duct smoke detector.

d) Zones as required by NFPA and FBC.

B. Notification Zones.

1. Regardless of the number of zones shown on drawings the minimum notification zones (horns and strobe lights) required are:

a) One (or more) circuit(s) for buildings.

b) One (or more) circuit(s) for exterior horns.

c) One (or more) circuit(s) for remainder of campus.

2. Breakdown circuits as required for load and distances involved.

PART 2- PRODUCTS

2.1 GENERAL EQUIPMENT AND MATERIAL REQUIREMENTS

A. All equipment shall be new and unused. All components and systems shall be designed for uninterrupted duty. All equipment, materials, accessories, devices, and other facilities covered by this specification or noted on the contract drawings shall be the best suited for the intended use and shall be provided by a single manufacturer.

B. Provide all equipment to match existing equipment required to perform all functions and/or features included in this section of the specifications although not specifically noted or specified herein.

C. Modify/rework existing system and reprogram existing system as required for extension to new devices and/or as required for proper operation of system with new devices, adding new zone modules, adding surge suppression, adding power supply and battery capacity to meet regulatory requirements with new devices, etc.

2.2 RACEWAYS

A. General:

1. All raceways (conduit, wireways, pullboxes, outlet boxes, etc.) shall comply with applicable requirements of sections within Division 16 of these specifications.

2. All raceways (conduit, wireways, pull boxes, outlet boxes, etc.) shall comply with all requirements of the manufacturer of the fire alarm system.

B. Conduit: Comply with Section 16111 except as noted below:

1. Pull Cords: Install pull cords in all raceway runs that are installed without cable.

2. Size: Minimum size shall be 3/4" conduit.

C. Boxes:

1. All outlet boxes, junction boxes, pull boxes, etc. shall comply with applicable section of these specifications.

2. Boxes shall be sized as required by the fire alarm system manufacturer and NEC for cables and/or device installed.

2.3 TERMINATION CABINETS

A. Terminal cabinets are to comply with applicable sections of these specifications.

2.4 "SYSTEMS" AND "LOCAL" GROUND BUS

A. Bus to comply with applicable sections of these specifications.

2.5 FIRE ALARM CONTROL PANEL (FACP)

A. General

1. The fire alarm control panel shall be of dead front construction and be modular in design. The control panel shall be capable of future expansion and shall provide active signal initiating as noted on drawings (or as herein) specified with zones as noted on drawings (or as herein specified). The control panel shall provide provisions for future expansion. The fire alarm control panel shall be semi-flush mounted (unless otherwise noted on drawings) and located as shown on the drawings.

B. System Capability

1. Communication with addressable devices: The system must provide communication with all initiating and control devices individually. All of these devices are to be individually annunciated at the control panel. Annunciation shall include "Alarm", "Trouble", "Open", "Short", "Ground", "Device Fail" or "Incorrect Device" conditions for each point.
2. All addressable devices are to have the capability of being disabled or enabled individually.
3. Each Signal Line Circuit (SLC) two-wire loop shall be capable of addressing a minimum of ninety-six (96) addressable devices and ninety-six (96) monitor or control modules.
4. Identification of Addressable Devices: Each addressable device must be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact.
5. Wiring Type, Distances, Survivability and Configurations: The system must allow up to 2,500 feet wire length to the furthest addressable device. Style 4 Signaling Line Circuit (as defined by NFPA-72) communications will be provided.
6. The system shall be capable of addressable devices and conventional devices within the same system.
7. All system circuits shall be inherently power limited per NEC.
8. The system shall be capable of communication with a minimum of fifteen (15) remote module locations.

C. Master Controller

1. The master controller shall be an integral part of the control panel and be microprocessor-based.
2. The master controller shall store all programming in non-volatile memory.
3. The master controller shall have an event log capable of storing a minimum of two hundred fifty-five (255) events in non-volatile memory.
4. The master controller shall include an eighty (80) character Liquid Crystal Display.
5. The master controller shall include, as a minimum, switches to accomplish Alarm/Trouble Acknowledge, Alarm Silence, Trouble Silence and System Reset.
6. The master controller shall include, as a minimum, LED's to indicate System Alarm, System Trouble, Supervisory Alarm and System Silence.

7. The master controller shall support connection of serial remote annunciators.
8. The master controller shall provide a minimum of two (2) notification appliance circuits (Class A or B, Style Z or Y).
9. The master controller shall be capable of being expanded as necessary to accommodate all required modules.

D. Notification Appliance Circuits

1. The Indicating Circuits Module shall provide fully supervised style P or M (Class A or B) indicating circuits. These circuits shall supervise and power polarity reversing loops containing up to 2 amperes of 24 Volt indicating devices.
2. An expansion printed circuit board shall be provided for this module to extend its capability to 8 such indicating circuits.
3. The module shall be provided with pluggable contact wiring terminal strips for ease of installation and service. The terminal strips shall be UL listed for 12 AWG wiring.

E. Control panel shall include all equipment required to alert fire department and/or owner's monitoring service.

F. Modem

1. A modem shall be provided as an integral part of the fire alarm control panel (FACP). The modem shall provide the Owner with the ability to accomplish the following functions:
   a) View device sensitivity information.
   b) Silence alarms and trouble signals.
   c) Bypass devices.
   d) View system activity in real time.
   e) Access and view the system history log.
2. The modem shall not allow changes to system programming.
3. The modem shall operate at a minimum speed of 9600 baud.
4. The modem shall provide an RJ-11 connector for connection to a telephone line.
5. The fire alarm contractor shall coordinate with the Premise Distribution System (PDS) contractor and/or the Telephone System contractor for interconnection to a telephone line. The PDS or Telephone contractor shall provide telephone interconnection wiring up to the modem.
6. The modem shall mount inside the fire alarm control panel (FACP).

2.6 POWER SUPPLY

A. Provide additional power supplies with battery backup for all equipment as required for a proper and operating fire alarm system with new equipment connected.

B. Power supplies shall supply sufficient power to sound all signals, flash all visual devices, and operate all required functions simultaneously, and shall operate on a single phase 120 VAC source.

C. The entire fire alarm system with new devices shall be provided with a continuous back-up power source (batteries) for uninterruptible service during normal/generator power switchover. The batteries shall provide operating and supervisory power for a minimum period of 24 hours, and shall be capable of operating all alarm devices for a duration of 15 minutes at the end of the 24 hour period. The standby battery system shall be supervised for both overcharging and low

battery. The power supply shall include a properly sized automatic battery charger.

D. The power supply for the panel and all fire alarm peripheral shall be integral to the control panel. The power supply shall provide all control panel and peripheral power needs as well as 3.0 amperes of unregulated 24 VDC power for external audio-visual devices. The audio-visual power may be increased as needed by adding additional modular expansion power suppliers. All power supplies shall be designed to meet UL and NFPA requirements for power-limited operation on all external signaling lines, including initiating circuits and indicating circuits.

E. The same manufacturer as the fire alarm control panel (FACP) shall provide all power supplies. Power supplies provided by manufacturers other than the manufacturer of the fire alarm control panel (FACP) shall not be acceptable.

F. Circuit breakers, or other over-current protection on all power outputs.

G. Input power shall be 120 VAC, 60 Hz. The power supply shall provide internal batteries and charger. Internal battery capacity shall be as required.

H. The battery pack shall provide maximum normal operating and supervisory power for:

1. 24 hours per NFPA 72
2. 60 hours per NFPA 72.
3. Provide low maintenance gel cell type batteries with sufficient ampere-hour rating to meet the above NFPA Standard and to operate all alarm signals for a duration of 15 minutes at the end of the required period of time.

I. Wall Mount Equipment Enclosure

1. The control panel, and all associated equipment, shall be housed in an enclosure designed for mounting directly to a wall or vertical surface. The back box and door shall be constructed of 16 gauge steel with provisions for electrical conduit connections into the sides and top. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators.
2. The enclosure(s) shall be of sufficient size to house all equipment required for this project. All equipment shall be mounted in the enclosure(s) as designed by the manufacturer. Provide enclosures in quantities as required to provide a complete, UL Listed Fire Alarm system.

2.7 PHOTOELECTRIC SMOKE DETECTOR

A. The contractor shall furnish and install Analog addressable photoelectric smoke detectors, as called for on drawings. The combination detector head and twist-lock base shall be UL-listed compatible with a UL-listed fire alarm panel.

B. The smoke detector shall have a flashing, status-indicating LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady and at full brilliance. Actuating the control panel reset switch may reset the detector.

C. The sensitivity of the detector shall be monitored without removal of the detector head. Metering test points shall be accessible on the exterior of the detector head. Field adjustment of the sensitivity shall be possible when conditions require a change.

D. The vandal-resistant, security locking feature shall be used in those areas as indicated on the drawings. The locking feature shall be field removable when not required.

E. It shall be possible to perform a functional test of the detector without the need of generating smoke. The test method must simulate effects of products of combustion in the chamber to ensure testing of all detector circuits.

F. To facilitate installation, the detector shall be nonpolarized. By using a furnished wire jumper, it

shall be possible to check circuit loop continuity prior to installing the detector head.

G. Voltage and RF transient suppression techniques shall be employed to minimize false alarm potential. A gated alarm output shall be used for additional detector stability.

2.8 IONIZATION SMOKE DETECTOR

A. The contractor shall furnish and install Analog addressable ionization smoke detectors, as called for on drawings. The combination detector head and twist-lock base shall be UL-listed compatible with a UL-listed fire alarm panel.

B. The smoke detector shall have a flashing, status-indicating LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady and at full brilliance. Actuating the control panel reset switch may reset the detector.

C. The sensitivity of the detector shall be monitored without removal of the detector head. Metering test points shall be accessible on the exterior of the detector head. Field adjustment of the sensitivity shall be possible when conditions require a change.

D. The vandal-resistant, security locking feature shall be used in those areas as indicated on the drawings. The locking feature shall be field removable when not required.

E. It shall be possible to perform a functional test of the detector without the need of generating smoke. The test method must simulate effects of products of combustion in the chamber to ensure testing of all detector circuits.

F. To facilitate installation, the detector shall be nonpolarized. By using a furnished wire jumper, it shall be possible to check circuit loop continuity prior to installing the detector head.

G. Voltage and RF transient suppression techniques shall be employed to minimize false alarm potential. A gated alarm output shall be used for additional detector stability.

2.9 DUCT MOUNTED SMOKE DETECTOR

A. The Duct Mounted Smoke Detector for the fire and smoke detection system shall be a high velocity rated Analog addressable series smoke detector intended for use with ventilation and conditioning ducts.

B. The detector shall provide detection of combustion gases and smoke in air conditioning ducts in compliance with NFPA 90A. The detector shall be UL-listed specifically for the use in air handling systems.

C. The detector shall operate at air velocities ranging from 300 feet per minute to 4000 feet per minute without requiring compensation for operation at specific air velocities. Sampling tubes of proper length shall be provided and installed to match duct width at the installed location.

D. Whether shown on drawings or not, a remote alarm indicator/test station shall be provided for each duct mounted smoke detector to annunciate smoke detector operation remotely. Mount unit in ceiling or wall near respective remote smoke detectors (in an occupied space).

2.10 ADDRESSABLE MODULE

A. Analog addressable device shall be furnished as required to monitor fire alarm or supervisory initiating devices or control auxiliary functions. Each module shall contain address switches to assign a unique input point for programming or control by the system.

2.11 RELAYS

A. Relays required for control (i.e. air handler shutdown, supply fan shutdown, exhaust fan shutdown, fan terminal box shutdown, door lock release, fire shutter release, smoke damper closure, fire damper closure, smoke/fire damper closure, or any other interface required by these specifications or applicable codes) shall be UL listed relays suitable for use in fire alarm systems.

B. Per NFPA, relays used for control of other systems shall be located within three feet (3') of the device to be controlled.

C. Relays shall be analog addressable devices powered and controlled from the fire alarm system. Each relay shall contain address switches to assign a unique input point for programming or control by the system.

D. Each relay shall provide at least one set of Form "C" dry relay contacts.

2.12 SURGE SUPPRESSION

A. Addressable Initiation Devices and Data Loops:

1. Plug-in replacement modular design with associated female wiring connector.
2. UL 497B listed and labeled.
3. Multi-stage hybrid protection circuit.
4. Fail short/fail safe.
5. Surge Capacity: 10KA with 8 x 20 μs waveform, 500A per line with 10 x 700 μs waveform.
6. Clamp Voltage: 150% of circuit peak operating voltage with 100 amp 10 x 700 μs waveform.
7. Maximum Continuous Operating Voltage: 125% of peak operating voltage, minimum.
8. Capacitance: 50 pf.
9. Manufacturer:
   a) EDCO #PC642C-LC series with #PCBIB base.

B. Power Circuit (120 volt):

1. UL 1449 listed.
2. 15 amp, 120V rated.
3. Suppressors shall be tested per IEEE, C62.41-1991 for Categories A and B.
4. Normal mode (L-N), and common mode (L+N-G) protection.
5. Internal fusing.
6. Hybrid design.
7. Indicators for normal operation and failure indication.
8. Enclosure:
   a) Fire retardant high impact, phenolic or plastic housing or metal enclosure.
9. Clamping voltage UL 1449, Line to Neutral, Category B Impulse At (3KA, 8 x 20 μs): 385V @ 120V.
10. Maximum Surge Capacity: 20,000 amps.
11. Maximum Continuous Operating Voltage: 115% of line voltage.
12. Provide hardwire connection or add 15 amp receptacle device to hardwired devices to match equipment being protected and maintain UL listing.
13. Provide additional 15 amp in-line fusing as required to comply with UL and the N.E.C. when connected to a 20 amp, 120V circuit.
14. Manufacturers:

a) Leviton #51020-WM (hardwired).

b) EDCO #HSP-121BL2.

C. Telephone Line Circuits

1. Must be UL 497 listed and labeled for primary protection.
2. Multi-stage hybrid protection circuit.
3. Plug-in replaceable modular design or individually mounted units.
4. Fail short/fail safe.
5. Surge capacity: 500 amp with 10 x 700µs waveform.
6. Clamp voltage: 150% of circuit peak operating voltage with 100 amp 10 x 700µs waveform.
7. Maximum continuous operating voltage: 125% of peak operating voltage, minimum.
8. Manufacturers:

a) EDCO #COHP(FS).

D. Terminations

1. Provide terminals sized for circuits required on project.
2. Where surge suppression modules are for mounting on 'M' block assembly, provide M block assembly complete with grounding system that mates with surge suppression equipment.

E. Terminal Cabinets

1. Provide terminal cabinets for all terminations and surge suppression equipment including 120VAC power surge suppressor as required in Section 16691. Size terminal cabinets as required to facilitate installation of terminations and surge suppression in a neat and workmanlike manner.
2. Terminal cabinet to meet specifications in Section 16160 unless specifically manufactured for use.
3. Manufacturers:

a) Interior.

1. Square "D"
2. Hoffman
3. BUD

b) Exterior.

1. Hoffman
2. BUD
3. Carlon

2.13 CABLE

A. Contractor shall provide and install cable as required by the manufacturer, as specified elsewhere in these specifications, and to provide a complete, fully operational, UL Listed Fire Alarm system.

B. Fire alarm system cables installed in exterior and/or underground raceways shall comply with the applicable sections of NEC Article 800.

2.14 PRESSURIZATION

A. Upon alarm from the Fire Alarm System, the Fire Alarm Control Panel shall activate pressurization fans for both stairwells and the elevator shaft. Systems contractor shall provide control relay, 24 V.D.C. coil, one per fan, to accomplish this action. Smoke dampers on the roof shall be closed in order for pressurization to be accomplished.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The contractor is advised that circuit routing for this system is not necessarily shown on the project drawings. The contractor shall provide and install all raceways, wiring and cabling required for a complete and fully functional system as intended by these specifications. All wiring and/or cabling shall be in conduit. Contractor shall provide and install a properly sized, flush mounted outlet box for every device. Contractor shall size and route raceways to accommodate the proper installation of the system cabling. T-Tapped cabling shall not be acceptable. In locations where raceway and/or conduit is not accessible after completion of the project, conduit shall be routed from device to device or fire rated access panels shall be installed to provide access to junction and pull boxes. Routing of raceway from device to device shall only be acceptable where the wiring scheme of the system, as recommended by the manufacturer, requires cable to pass from device to device. Contractor shall properly terminate each device according to the manufacturer’s recommendations. Provide and install firestopping where penetrations are made through rated walls and floors.

B. Make final connections between new or modified components and the existing fire detection and alarm system.

C. Provide any programming required at the fire alarm control panels, remote panels or fireworks computers. This includes programming in support of outages, planned or unplanned, of the system.

D. Test and certify the completed system in accordance with all regulatory requirements.

E. Update the system as-built drawings, CAD files and bitmaps.

F. Locate, install, and test fire alarm and detection systems in accordance with the equipment manufacturer's written instructions, and the latest editions of the NFPA, the National Electrical Contractor's Association publication "Standard of Installation" and all applicable codes and standards referenced in this specification.

G. Modify/rework existing system as required for extension to new devices and/or as required for proper operation of entire system, adding new zone modules, surge suppression, power supply and battery capacity or new devices to meet regulatory requirements.

H. Rework/modify/reprogram existing fire alarm control panel and remote control panels to accept and reflect all changes made by alterations as specified.

I. Modify/update the existing fire alarm as-built (mylars and blueline) drawings and CAD files to reflect modifications, additions, etc., made by this project. Provide blueline sets of changes for approved and company with all additional requirements as outlined in specifications.

J. Provide all work required for a complete system including complete system testing and checkout. All components shall be properly mounted and wired. The installation of this system shall comply with the directions and recommendations of authorized factory representatives.

K. Provide wiring, cabling, raceways, and electrical boxes in accordance with manufacturer's written instructions.

L. Components shall be electrically "burned-in" by operating the component at full power for a period as recommended by the manufacturer.

M. Installation shall be done in a neat workmanlike fashion by a firm regularly engaged in Fire Alarm Installation and Service.

N. The installation and inspection of all fire detection and fire alarm devices and systems shall be performed by, or under the direct on-site supervision of, a licensed fire alarm technician or a fire alarm planning superintendent who shall certify the work upon completion of the activity. The certifying licensee shall be present for the final test prior to certification.

O. Installation plans and wiring diagrams shall bear the signature and license number of the licensed Fire Alarm Planning Superintendent, the date of installation and the name, address, and certificate of registration number of the registered firm.

P. After completion of the installation of the system, the licensee shall complete a NFPA installation certificate. The installation certificate format shall be furnished by the State Fire Marshal. When an installation certificate form has been completed, legible copies shall be distributed as directed by the State Fire Marshal.

Q. After an installation has been complete, affix a Fire Alarm Tag to the control panel. The Fire Alarm Tag is in addition to the installation certificate. Protect the Fire Alarm Tag from vandalism by applying pressure sensitive label; do not use a “tie on” tag. It shall be as required in the Fire Safety Rules as promulgated by the Florida State Fire Marshal.

R. Power supplies are to be loaded to a maximum of 75% of their capacity. Provide additional power supplies where required to comply with this maximum loading requirement.

S. As-built plans and wiring diagrams shall bear the signature and license number of the licensed fire alarm planning superintendent, the date of installation and the name, address, and certificate-of-registration number of the registered firm.

T. Installation of detectors:

1. All ceiling mounted detectors shall be installed in accordance with the requirements of NFPA 72.

2. All concealed detectors shall be provided with a remote indicating lamp and test switch installed in an occupied space (corridor, etc.) on wall or on the ceiling grid indicating the type of detector and the zone to which it is connected. Label shall be red with white lettering.

3. Duct detectors shall be installed in accordance with NFPA 90A. All brackets and hardware shall be provided as required to install detector housing in correct position. All detector housings shall be sealed as required to prevent air leakage between duct and housing. Sampling tubes of proper length shall be provided and installed to match duct width at the installed location.

3.2 RACEWAYS AND BOXES

A. Provide dedicated raceway with applicable boxes for all fire alarm wiring in accordance with applicable sections of these specifications.

B. All initiating, indicating and auxiliary control devices shall be mounted on UL listed outlet boxes.

C. Provide supporting devices per Section 16190.

D. Identify raceways and boxes per Section 16195.

3.3 WIRE/CABLE

A. Conductor: 98% conductivity, solid copper or stranded copper. If stranded conductors are used, then a compression lug shall be installed at every end. Wrapping twisted strands at terminal block screw is not acceptable. As an acceptable equivalent, stranded conductors without crimp-on lugs may be terminated into terminal strips of box-lug connectors.

B. Insulation: A type accepted by NEC for the application. Individual conductors shall be Type THHN/THWN. All cable shall be UL listed for fire-protective signaling application. Communication, Class 3 or Multi-Purpose cables shall not be substituted for FP cable types.

C. Size: All conductors shall be sized as prescribed by the system manufacturer, with following minimums:

1. Multiplex Signaling Line Circuit: AWG #14, shielded twisted pair cable.
2. Initiating Circuits, Hard-Wired Devices: AWG #14, THHN/THWN conductors.
3. Notification Circuits: AWG #14, THHN/THWN conductors.
4. Initiating Circuits, Addressable Devices: AWG #14, shielded twisted pair cable.
5. Provide larger conductors where required to maintain voltage drop or signal strength within acceptable limits.

D. The above wire sizes shall be increased to size as required to comply with authority having jurisdiction or as required for voltage drop, load, etc.

E. Color Coded:

1. Wiring shall be color coded as required to match existing system.
2. Permanent wire materials shall be used to identify all splices and terminations for each circuit at all junction boxes, outlet boxes, and terminations.

F. UL:

1. General: Fire-protective signaling cable shall be UL listed as non-power limited or power limited as needed to match the output of the fire alarm equipment.
2. Power Limited: Fire protective signaling circuits classified as power limited shall use cable listed under UL Category HNIR, "POWER LIMITED FIRE-PROTECTIVE SIGNALING CABLE". All such circuits shall be durably marked where plainly visible at terminations to indicate that it is a power-limited fire protective signaling circuit. Refer to paragraph titled "Fire Resistance of Cables" for additional requirements.
3. Fire Resistance of Cables: Power-limited fire-protective signaling circuit cables shall be UL listed as described in NEC 760.179. All such cable shall bear a cable marking that includes a Type designation as given in NEC Table 760.179(I). Provide Type FPL.

G. Connections of Installation Wiring:

1. Connections to Equipment: In accordance with NFPA for monitoring integrity and with the equipment manufacturer's instructions.
2. Connections of installation wiring to alarm initiating devices and alarm indicating appliances shall be monitored for integrity.
3. Interconnecting means shall be arranged so that a single break or single ground fault will not cause an alarm signal.
4. Apply a compression lug, similar to T&B Sta-Kon Terminal, to all stranded conductors at terminations or use box-lug terminal strips.
5. There shall be no wire splices. All wiring shall be continuous, uncut between devices and terminal blocks.

H. Rated Enclosures:

1. All vertical fire alarm wiring traversing more than one level shall be routed in rated enclosures. In addition, all horizontal wiring serving devices location on floors other than where wiring originates shall be routed in 2-inch concrete encasement, suitable rated

building construction, or 2-hour wrap application enclosure accepted by local authority having jurisdiction.

3.4 END-OF-LINE DEVICE

A. Mount end-of-line device box with last device or separate box adjacent to last device in circuit.

3.5 AUXILIARY CONTROL RELAYS

A. An auxiliary fire alarm relay used to control an emergency control device, e.g. motor controller for HVAC system fan or elevator controller shall be located within 3 ft. of the emergency control device.

B. The installation wiring between the system panel and the auxiliary fire alarm relay shall be monitored for integrity.

C. Auxiliary control relays shall be listed for use with fire alarm systems.

3.6 INSTALLATION OF DUCT DETECTORS

A. Comply with all applicable codes and standards including but not limited to:

1. NEMA Guide for Proper Use of Smoke Detectors in Duct Applications
2. Full requirements of detector UL listing.
3. NFPA 90.
4. Refer to Part 1 – General for additional standards.

B. Location: To permit proper sampling of the air within a duct, locate supply air duct detectors downstream from fans, filters, humidifiers, and heating/cooling elements (if codes permit). Locate supply or return air duct detectors at least six duct widths (diameters) from any opening, detector, bend, or branch connection. When physical parameters or codes make it impossible to meet the six width requirement, locate the detector as far as possible from the obstacle.

C. All brackets and hardware shall be provided as required to install detector housing in correct position. All detector housings shall be sealed as required to prevent air leakage between duct and housing.

D. All concealed detectors shall be provided with a remote indicating lamp installation in an occupied space (corridor, etc.) on wall or on the ceiling grid indicating the type of detector and the zone to which it is connected. Label shall be red with white lettering.

3.7 STAIRWAY PRESSURIZATION

A. Upon alarm from the Fire Alarm System, the Fire Alarm Control Panel shall activate pressurization fans for both stairwells and the elevator shaft. Provide control relay, 24 V.D.C. coil, one per fan, to accomplish this action. Also, the applicable smoke dampers on the roof shall close in order for pressurization to be accomplished.

3.8 MAIN FIRE ALARM CONTROL PANEL AND ASSOCIATED EQUIPMENT

A. Install all programming and software changes to existing fie alarm control panel to provide a complete and operational extension of the existing system as specified.

B. All functions/operations/performance specified are to match the same functions/operations/ performance of the existing fire alarm system.

C. All color graphic AutoCAD bit maps shall be updated and tested.

3.9 ELEVATORS

A. Operation of elevators under fire or other emergency conditions - elevators having a travel distance of 25 feet or more shall conform to the requirements of ANSI A17.1, Safety Code for

Elevators and Escalators, 2004 Edition, Rule 2.27.3, as incorporated herein by reference.

B. When an automatic sprinkler system is required to be installed throughout a building for complete fire protection coverage, the provisions of ANSI A17.1, Rule 2.8.2, which is incorporated herein buy reference, shall be applicable. When an automatic sprinkler system is required to be installed, the automatic sprinkler system shall be a pre-action sprinkler system and the pre-action sprinkler shall be installed in the elevator machine room and elevator hoistway. An accepted fixed temperature (135 degrees F.) heat detector shall be installed in the elevator machine room, elevator pit, and elevator hoistway as an integral part of the pre-action sprinkler system to automatically disconnect the main power supply to the affected elevator(s) prior to the application of water. The main power supply shall not be self-resetting. The activation of sprinklers outside of the hoistway or machine room shall not disconnect the main power supply. The sprinkler head located in the elevator machine room and elevator hoistway shall have an activation temperature greater than the accepted fixed temperature heat detector.

C. In addition to the requirements of ANSI A17.1, Rule 2.27.3.2.1, an accepted smoke detector(s) shall be installed in the elevator hoistway, and the machine room meeting the requirements of Rule 4A-47.008. The activation of the smoke detector(s) in the machine room or the elevator hoistway shall cause a suitable warning light to flash. The light is to be located adjacent to the "phase one" recall switch required by ANSI A17.1 Rule 2.27.3.1 or elevator hall button. The warning light shall be red, and a minimum diameter of 1/8 inch. A sign shall be incorporated with or adjacent to the light and contain the following wording "DO NOT USE ELEVATOR". The minimum size for the letters on the sign shall be 1/8 inch. Provide supervised fire alarm system wiring and power to elevator warning lights. Lights shall function per elevator bank. Provide and install light at first floor and alternate floor as directed by authority having jurisdiction.

D. Provide detectors with auxiliary relay complete with tie into elevator controller as required by all codes, or provide separate zone.

3.10 CABLE IDENTIFICATION

A. Provide and install permanent cable markers on all cables/wire lines, telephone lines, etc. at terminal strips, terminal cabinets and at main equipment.

3.11 TELEPHONE TIE

A. Provide new conduit/wire from FACP and terminal cabinet to main telephone board. Connect as directed by owner/telephone company. Provide and install dialer with surge suppression on telephone line.

3.12 SURGE PROTECTION

A. General

1. Provide, install and connect new surge suppression equipment as specified herein, including protection of equipment power source, cable/wire entering or leaving building housing, main fire alarm system equipment, ground lugs, #6 copper ground wire in 3/4"c. to existing main building service ground.

2. Extreme care shall be taken by contractor to assure a properly surge protected system.

3. Surge protection equipment must be selected by contractor to match the equipment being protected including wire sizes, operating volts, amps, and circuit impedance.

4. Installation of surge protection equipment and its grounding must be per manufacturer's recommendations to assure short and proper ground paths.

B. Equipment Selection

1. Contractor to coordinate with suppliers and installers of all equipment being protected and provide surge suppression equipment which meets these specifications on respective

equipment, wires, etc.

C. Equipment Installation

1. Install surge suppression equipment per manufacturers recommendation at each wire terminal as noted under Part 1.
2. Install in surge suppression equipment terminal cabinets, etc. as required to facilitate installation of surge protection equipment and terminal points. Increase size of terminal cabinets (from that shown on drawings) to size required to facilitate installation of surge suppression equipment and terminal blocks.
3. Locate surge suppression equipment in terminal cabinet nearest main equipment cabinet (FACP).
4. Coordinate with Section 16691 contractor to assure that surge suppression for 120VAC power circuit and surge suppression required by this section are all installed in same terminal cabinet and bonded together.

D. Ground Installation

1. Ground Bus Connections.
   a) Provide "local" ground bus in each terminal cabinet housing surge protection equipment (with lugs, etc. as required).
   b) Bond "local" ground bus to terminal cabinet with minimum #6 copper wire.
   c) Connect terminal cabinet "local" ground bus to "systems" ground bus installed per 16170 with minimum #6 copper insulated wire (unless otherwise noted) in conduit.
   d) Note that "systems" ground bar is also to be used for power transformation ground (480V to 208V) where applicable.
2. Surge suppression equipment grounding.
   a) Connect each surge suppressor to local ground bus in terminal cabinet with wire sized as recommended by manufacturer. Where "M" block type terminations/surge suppressors are used, bond ground rail to local ground bar with wire as recommended by manufacturer.
   b) Coordinate with Section 16691 contractor to assure that 120VAC power source/supply surge suppressor is also grounded to same local ground bus as surge suppressors provided in this section for same system (i.e. fire alarm, intercom, television, etc.).
3. Conductors.
   a) Conductors shall meet requirements of Section 16123. Minimum size to be #12 THWN.
   b) Bends in excess of 90 degrees in any grounding conductor shall not be permitted. A radius of 6 inches or greater shall be maintained on all bends.
   c) Do not bundle unprotected conductors with protected conductors.
   d) Conductors shall be kept as short as possible.
   e) Conductors shall be secured at 12" intervals with an accepted copper clamp.
   f) Grounding conductors shall be properly connected to the building service ground by accepted clamps.
4. Grounding Connectors

a) Connectors, splicers, and other fittings used to interconnect grounding conductors, bond to equipment or grounding bars, shall be accepted by NEC or UL for the purpose.

b) All connectors and fittings shall be of the Nicopress crimp or compression set screw type.

c) Special treatment to fittings, lugs, or other connectors of dissimilar material shall be applied to prevent electro-galvanic action.

5. Telephone Circuits

a) Systems utilizing telephone company pairs as a transmission medium shall be provided with a suppressor conforming to device in Part 2 of this specification.

b) Suppressors shall be installed at each point where interface is made to telephone company pairs.

c) In cases where a modem or other device is used to interface with the telephone circuit the following procedure shall apply:

1. Where the modem or coupling device is furnished by the telephone company the suppressors shall be installed on the system side of the modem or coupling device.

2. Where the modem or coupling device is furnished by the system contractor, the suppressor shall be installed on the telephone line side of the modem or coupling device.

3.13 EXISTING CONDITIONS

A. Contractor shall investigate existing conditions prior to bid.

3.14 CONDUIT/BOX IDENTIFICATION

A. Contractor shall identify fire alarm conduit and boxes with red paint in exposed locations. Identify conduit in concealed locations with 4" mark of red paint every 4'-0" O.C.

3.15 DEMONSTRATION

A. When system is complete it shall be demonstrated to owner's representative who shall be given complete instructions, spare parts, manuals and maintenance information.

3.16 SYSTEM TESTING

A. Prior to certification of the fire alarm system the contractor shall accomplish a complete test of the fire alarm system in accordance with NFPA 72, Chapter 10, paragraph 10.4 Testing.

B. Perform a complete, functional, component by component test of the entire fire alarm and detection system. Provide a detailed step by step testing procedure, which is unique to this project, reflecting the type of system and the number and location of all components.

C. Demonstrate the proper operation of each component as follows:

1. Ionization, photoelectric, and duct smoke detectors: activate the detector with a "false smoke" product which has been specifically formulated for testing smoke detection systems.

2. Heat detectors: activate the detector by utilizing the detector check button.

3. Pull Stations: activate the station by operating the station in its normal mode.

4. Audible and Visual Alarms: verify proper operation when the system is put into the alarm mode.

5. Sprinkler Flow Switches: open the sprinkler system's inspection test valve. Verify that the flow switch sends an alarm signal within the allowed time corresponding to the switch's time delay setting.

6. Fire Alarm Panels: functionally check-out and test the panel per the manufacturer's written instructions. Demonstrate the proper operation of each modular component. Demonstrate automatic power change to batteries and back to building power upon a drop in voltage below the voltage threshold as specified by the panel manufacturer.

D. Demonstrate the supervisory function at each device loop circuit, and at all single component wiring runs such as for the sprinkler valve supervisory switches.

3.17 CERTIFICATION

A. After completion of the installation of the system, the licensee shall complete a NFPA Inspection and Testing form. The Inspection and Testing form format shall be as indicated in NFPA 72, Chapter 10, Figure 10.6.2.3 Inspection and Testing form. When an Inspection and Testing form has been completed, legible copies shall be distributed as directed by the Authority Having Jurisdiction.

B. After an installation has been complete, affix a Fire Alarm Tag to the control panel. The Fire Alarm Tag is in addition to the Inspection and Testing form. Protect the Fire Alarm Tag from vandalism by applying pressure sensitive label; do not use a "tie-on" tag. It shall be as required in the Fire Safety Rules.

3.18 FINAL DRAWINGS

A. As-built drawings shall be given to the Owner’s representative, at time of instruction, in addition to those to be supplied as general requirements of the job.

3.19 AUTHORITY HAVING JURISDICTION

A. The drawings and specifications herein comply to the best of the engineer's knowledge with all applicable codes at time of design. However, it is this contractor's responsibility to coordinate/verify (prior to bid) the requirements of the authority having jurisdiction over this project and bring any discrepancies to the Engineer's attention at least 7 days prior to bid. No changes in contract cost will be acceptable after the bid for work/equipment required to comply with the Authority Having Jurisdiction.

END OF SECTION