TITLE 1B
SPECIFICATIONS

REPAIR HANGAR DOORS, B6604
BARKSDALE AFB, LOUISIANA

AWUB 15-0091

PROJECT ASSOCIATES:

CIVIL ENGINEERS
S. E. HUEY CO.
1111 N. 19TH ST.
MONROE, LA 71201
(318) 325-1791
www.sehuey.com

MECHANICAL/ELECTRICAL ENGINEERS
JOHN J. GUTH ASSOCIATES
208 MILAM ST.
SHREVEPORT, LA 71101
(318) 221-8638

REPAIR HANGAR DOORS, B6604
BARKSDALE AFB
AWUB 15-0091

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Specifications:

SECTION 01010 - SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 PROJECT/WORK IDENTIFICATION

A. General: Project name is "REPAIR HANGAR DOORS FAC #6604 – AWUB 15-0091" as shown on Contract Documents prepared by S. E. Huey Co. and John J. Guth Associates, Inc. Drawings and Specifications**.**

B. Summary by References: Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary Conditions, Specification Sections, Drawings, addenda and modifications to the Contract Documents issued as part of addenda subsequent to the initial printing of this project manual and including, but not necessarily limited to, printed material referenced by any of these. It is recognized that work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon, including weather conditions, and other forces outside the Contract Documents.

C. Abbreviated Written Summary: Briefly and without force and effect upon the contract documents, the work of the Contract can be summarized as follows:

1. Refurbishment of all existing hangar doors in building 6604 (Hangar One) at Barksdale Air Force Base. Cleaning of all storm drain lines in building also included.

D. Utility Interruptions: Utility interruptions shall be held to a minimum and will be permitted only at times approved by the User Agency. The User Agency may require that any outages be during nights, weekends, or holidays. Provide any required overtime work at no additional cost to the Owner.

E. Shop Drawings

1. Contractor shall provide detailed AutoCAD shop drawings of all project work incorporating this statement of work and requirements of other project contract documents. Contractor shall provide thorough field investigation required for preparing the shop drawings.

2. Shop drawings which shall include detailed demolition and new work plans, hangar door and aperture repair plans, hangar door and aperture electrical plan and schematics, door and aperture operating control plans, schedules for motors, gearboxes, powertrain components, etc. and details of architectural, civil, structural, related to door repair project work.

3. Contractor shall not perform any construction work until all final shop drawings submittals are approved; submit per section 01400 and this section.

F. The Contractor shall be responsible for the printing costs for the reprinting of construction documents for their use.

G. The Contractor shall be responsible for meeting all applicable OSHA standards, including the Hazard Communication Standards.

H. Superintendent: Contractor is responsible for providing a full-time on-site superintendent for this project.

I. Completion Date: As required by Instructions to Bidders, the Contractor is required to fully complete construction of project within 240 calendar days. Contractor shall furnish sufficient forces, construction plant and equipment, and work such hours, including weekend and night shifts as may be necessary to insure prosecution of work in accordance with schedule to the contracted completion date. If, in the opinion of the Contracting Officer's Representative and Owner, Contractor falls behind progress schedule, Contractor shall take steps as may be necessary to improve his progress by such means as increasing number of men, number of shifts, days of work, and/or amount of construction plant, all without additional cost to Owner. If access to building is required at other than normal building hours, Contractor shall make arrangements with User Agency.

1.3 CONTRACTOR USE OF PREMISES

A. General: The Contractor shall limit his use of the premises to the work indicated, so as to allow for Owner occupancy with minimum interruptions. All access to building will require an escort, and therefore require making arrangements with user agency.

B. Use of the Site: Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction.

C. Keep existing driveways and entrances serving the premises clear and available to the Owner and his employees at all times. Do not use these areas for parking or storage of materials.

D. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas approved by User Agency. If additional storage is necessary, obtain and pay for such storage off-site. The Owner will not make payments for materials stored off-site.

E. Lock automotive type vehicles, such as passenger cars and trucks and other mechanized or motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.

F. Use of existing toilets within the buildings by the Contractor and his personnel will not be permitted.

G. General Requirements: Observe no smoking rules. All personnel must wear shirts. No radios or similar items may be used.

H. Asbestos: There is no asbestos abatement work included in this project. No asbestos-containing materials have been identified on items that are indicated to be disturbed. If asbestos-containing materials are encountered, please notify the Contracting Officer's Representative immediately.

1.4 OWNER OCCUPANCY

A. Full Owner Occupancy: The Owner will occupy the site during the entire period of construction. Cooperate fully with the Owner and his representative during construction operations to minimize conflicts and to facilitate Owner usage. Perform the work so as not to interfere with the Owner's operations. All access to building will require an escort, and therefore require making arrangements with user agency.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 01010

SECTION 01045 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for cutting and patching.

B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the work.

1. Requirements of this Section apply to civil, structural, and architectural installations. Refer to Divisions 2, 3, 5, 6, 7, and 8 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform work.
4. Indicate dates when cutting and patching is to be performed.
5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
7. Approval by the Contracting Officer’s Representative to proceed with cutting and patching does not waive the Contracting Officer Representative's right to later require complete removal and replacement of a part of the work found to be unsatisfactory.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

1. Foundation construction.
2. Bearing and retaining wall.
3. Structural concrete.
4. Structural steel.
5. Lintels.
6. Timber and primary wood framing.
7. Structural decking.
8. Stair systems.
9. Miscellaneous structural metals.
10. Exterior curtain wall construction.
11. Equipment supports.
12. Piping, ductwork, vessels and equipment.
13. Structural systems of special construction in Division 11.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:

a. Shoring, bracing, and sheeting.
b. Primary operational systems and equipment.
c. Air or smoke barriers.
d. Water, moisture, or vapor barriers.
e. Membranes and flashings.
f. Fire protection systems.
g. Noise and vibration control elements and systems.
h. Control systems.
i. Communication systems.
j. Conveying systems.
k. Electrical wiring systems.
l. Special construction specified by Division 13 Sections.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Engineer's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace work cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent

surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

1. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
3. Comply with requirements of applicable Sections of Division 16 where cutting and patching requires excavating and backfilling.
4. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3.4 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely excess material, paint, mortar, oils, putty and items of similar nature.

END OF SECTION 01045

SECTION 01090 - DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including other Division 1 Specification sections, apply to work of this Section.

1.2 DESCRIPTION OF REQUIREMENTS

A. General: This section specifies procedural and administrative requirements for compliance with governing regulations and codes and standards imposed upon the work. These requirements include obtaining permits, licenses, inspections, releases, and similar documentation, as well as payments, statements, and similar requirements associated with regulations, codes, and standards.

B. The term "Regulations" is defined to include laws, statutes, ordinances, and lawful orders issued by governing authorities, as well as those rules, conventions, and agreements within the construction industry which effectively control the performance of the work regardless of whether they are lawfully imposed by governing authority or not.

1.3 DEFINITIONS

A. General Explanation: Certain terms used in Contract Documents are defined in this Article. Definitions and explanations contained in this Section are not necessarily complete, but are general for the work to extent that they are not stated more explicitly in another element of the Contract Documents.

B. General Requirements: Provisions and requirements of other Division 1 Sections apply to the entire work of the Contract and, where so indicated, to other elements which are included in the project.

C. Indicated: The term "indicated" is a cross-reference to graphic representations, notes, or Schedules on the Drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for the purpose of helping the reader locate the cross-reference, and no limitation of location is intended except as specifically noted.

D. Directed, Requested, Etc.: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by the Contracting officer’s representative," "requested by the Contracting officer’s representative," and similar phrases. However, no such implied meaning will be interpreted to extend the Contracting officer’s representative's responsibility into the Contractor's area of construction supervision.

E. Approve: Where used in conjunction with the Contracting officer’s representative's response to submittals, requests, applications, inquiries, reports, and claims by the Contractor, the term

"approved" will be held to limitations of the Contracting officer's representative's responsibilities and duties. In no case will the Contracting officer's representative's approval be interpreted as a release of the Contractor from responsibilities to fulfill requirements of Contract Documents or acceptance of the work, unless otherwise provided by requirements of the Contract Documents.

F. Project Site: The term "project site" means the space available to the Contractor for performance of the work, either exclusively or in conjunction with others performing other construction as part of the project. The extent of the project site is shown on the Drawings, and may or may not be identical with the description of the land upon which the project is to be built.

G. Furnish: The term "furnish" is used to mean "supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations."

H. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimensions, finishing, curing, protecting, cleaning, and similar operations."

I. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

J. Installer: The "installer" is "the entity" (person or firm) engaged by the Contractor, its subcontractor, or sub-subcontractor for performance of a particular element of construction at the project site, including installation, erection, application, and similar required operations. It is a requirement that installers are experienced in the operations they are engaged to perform.

K. Testing Laboratory: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests of the work, either at the project site or elsewhere, and to report and (if required) interpret results of those inspections or tests.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Except where more explicit or stringent requirements are written into the Contract Documents, applicable construction standards have the same force and effect as if bound into or copied directly into the contract documents. Such industry standards are made a part of the Contract Documents by reference. Individual specification sections indicate which codes and standards the Contractor must keep available at the project site for reference.

B. Referenced standards (standards referenced directly in the contract documents) take precedence over standards that are not referenced but generally recognized in the industry for applicability to the work.

C. Unreferenced Standards: Except as otherwise limited by the Contract Documents, standards not referenced but recognized in the construction industry as having direct applicability will be enforced for performance of the work. The decision as to whether an industry code or standard is applicable, or as to which of several standards are applicable, is the sole responsibility of the Contracting officer's representative.

D. Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of Contract Documents.

E. Conflicting Requirements: Where compliance with two or more standards is specified, and where these standards establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the contract documents specifically indicate otherwise. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Contracting officer's representative for a decision before proceeding.

F. Minimum Quantities or Quality Levels: In every instance, the quantity or quality level shown or specified is intended to be the minimum to be provided or performed. Unless otherwise indicated, the actual work may either comply exactly, within specified tolerances, with the minimum quantity or quality specified, or may exceed that minimum within reasonable limits. In complying with these requirements, the indicated numeric values are minimum or maximum values, as noted, or as appropriate for the context of the requirements. Refer instances of uncertainty to the Contracting officer's representative for decision before proceeding.

G. Copies of Standards: The contract documents require that each entity performing work be experienced in that part of the work being performed. Each entity is also required to be familiar with industry standards applicable to that part of the work. Copies of applicable standards are not bound with the contract documents.

H. Where copies of standards are needed for proper performance of the work, the Contractor is required to obtain such copies directly from the publication source.

I. Although copies of standards needed for enforcement of requirements may be required submittals, the Contracting officer's representative reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.

J. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where acronyms or abbreviations are used in Specifications or other Contract Documents they are defined to mean the recognized name of the trade association, standards generating organization, governing authority or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

1.5 SUBMITTALS

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

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01090

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 RELATED SECTIONS

A. Construction Schedule: Division 1 Section 01400, "Submittals."

1.3 PROGRESS MEETINGS

A. No regularly-scheduled progress meetings will occur during the construction period. Meetings will only be scheduled as necessary to address questions or problems related to the construction.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01200

SECTION 01400 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including other Division 1 Specification Sections, apply to work of this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Closeout Submittals: Division 1 Section 01700, "Project Closeout."

1.3 CONSTRUCTION SCHEDULE

A. General: Contractor shall, within ten days after signing the Contract, prepare and submit to Contracting Officer's Representative for information purposes, a practical schedule showing order in which Contractor proposes to carry on work, dates on which he will start salient features of work, and contemplated dates for completion. Schedule shall meet or better construction time included in Contract Documents.

B. Form of Schedule: Provide in form of horizontal bar chart. Provide separate horizontal bar column for each trade or operation. Order shall be Table of Contents from Project Manual or the chronological order of beginning of each item of work. Submit three copies to Contracting Officer's Representative.

C. Content of Schedule: Provide complete sequence of construction activity, dates for beginning, and completion of each element of construction. Identify work of separate phases or other logically grouped activities. Show projected percentage of completion for each item of work as of first day of each month.

1.4 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

A. Shop Drawings:

1. Submit prints of original drawings prepared by Contractor, subcontractor, supplier, or distributor which illustrate same portion of work; showing fabrication, layout setting, or erection details.
2. For extensive modifications, prints may be returned to Contractor for correction. When reviewed, Contracting Officer's Representative will retain two copies for record and return remaining copies to General Contractor for distribution. Reproducible copies of shop drawings will not be reviewed.

B. Product Data:

1. Manufacturer's Standard Drawings: Modify drawings to delete information which is not applicable to project. Supplement standard information to provide additional information applicable to project.

2. Manufacturer's Catalog Sheet, Brochures, Diagrams: Clearly mark each copy to identify pertinent materials, product, or models. Show dimensions and clearances required. Show performance characteristics and capacities.

C. Samples:

1. Physical examples to illustrate materials, equipment, or workmanship to establish standards by which completed work is judged.
2. Office samples shall be of sufficient size and quantity to clearly illustrate functional characteristics of product or material and full range of color and texture samples.

D. General Submission Requirements:

1. Quantities: Submit the number of copies of product data and shop drawings that the Contractor requires for distribution, plus two copies which will be retained by the Contracting Officer’s Representative. Quantity of samples required shall be as specified in Specification Section for respective product.

E. Submittals shall include:

1. Project title.
2. Names of Contractor, Subcontractor, Supplier, Manufacturer.
3. Identification of Product.
4. Relation to adjacent structure or materials.
5. Field dimensions.
6. Reference to Engineer's drawing numbers, specification section, room numbers, structural framing marks, and/or numbers.
7. Applicable standards: e.g., ASTM.
8. Blank space for Engineer's stamp.
9. Identification of deviations from Contract Documents.
10. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements, and compliance with Contract Documents.

F. Return and Disapproval of Submittals:

This is a routine project. The Contracting Officer will return submittals made with AF Form 3000 to the Contractor within 14 days after receipt, using the AF Form 3000 to show approval or disapproval. Resubmit revisions of disapproved submittals within 14 days after receipt of disapproval, again using AF Form 3000. Disapproval shall not be cause for a time extension.

G. Submittal Register: Contractor is to use and adhere to Submittal Register provided at the end of this Section.

1.5 SCHEDULE OF VALUES

A. General: Submit to Owner a Schedule of Values at least ten days prior to submitting first Application for Payment. Upon request by Owner, support values with data that will substantiate their correctness. Use Schedule of Values only as basis for Contractor's Application for Payment. Itemize separate line item cost for work required by each section of this specification.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01400

SCHEDULE OF MATERIAL SUBMITTALS
BARKSDALE AFB

PROJECT NO.	PROJECT TITLE	SOLICITATION/CONTRACT NO.
UHHZ159000	RPR/ RPL HVAC system, B/221	FA8501-XXXX

TO BE COMPLETED BY PROJECT ENGINEER

LINE NUMBER	ITEM OR DESCRIPTION OF ITEM, CONTRACT REFERENCE, TYPE OF SUBMITTAL	NO. OF COPIES REQUIRED: BEFORE CONSTR: SHOP DRAWINGS	SAMPLES	COLOR SELECTION	MANUFACTURER'S RECOMMENDATIONS	CATALOG DATA	OTHER MATERIAL OR DATA	AFTER CONSTR: CERTIFICATION OF COMPLIANCE AND CLOSEOUT	CLOSEOUT	MANUFACTURER'S WARRANTY	OPERATING INSTRUCTIONS	REQUIRED SUBMITTAL DATE	DATE RECEIVED IN CONTRACTING	DATE TO CIVIL ENGR.	RETURN SUSPENSE DATE	FOLLOW-UP	DATE CONTRACTOR NOTIFIED: APPROVED	DISAPPROVED	CONTRACTOR RESUBMITTAL	FINAL APPROVAL	REMARKS
1	Shop Drawings Submittal	4										NTP + 30									
2	Equipment Material Submittals				4							NTP + 21									
3	Equipment Manufacturer's catalog cut sheets					4						NTP + 21									
4	Other Material Submittals See applicable spec sections for all mat. submittals (constr.)				4							NTP + 21									
5																					
6	Corrected Final shop drawings Submittal	4										NTP + 40									
7	AF2519 Welding and Safety Checklist						4					NTP + 21									
8	Contractor's Kickoff Meeting Checklist						4					At Kick-off Meeting									
9	Work Plan						3					NTP + 21									
10	Solid Waste Disposal Plan						3					NTP + 21									
11	Storage and Trailer Request						4					NTP + 21									
12	Time Schedule						4					NTP + 21									
13																					
14	AF Form 3064 & 3065						2					NTP + 21									
15	List of Proposed Subcontractors						1					NTP + 21									
16	Superintendent & Certified Formen						1					NTP + 21									
17	Systems Functional Test Report							4				7 Days prior to Pre-Final Insp.									
18	Request for Final Inspection							1				7 Days prior to Pre-Final Insp.									
19	Operations and Maintenance Manuals										4	Prior to Closeout									
20	As-built Drawings (for each project)										4	Prior to Closeout									
21	Warranties									1		Prior to Closeout									
22	Construction List of Material Submittals								1			Prior to Closeout									
23																					
24																					
25																					
29																					
30																					
31																					
32																					

SCHEDULE OF MATERIAL SUBMITTALS
BARKSDALE AFB

PROJECT NO.	PROJECT TITLE	SOLICITATION/CONTRACT NO.
UHHZ159000	RPR/ RPL HVAC system, B/221	FA8501-XXXX

TO BE COMPLETED BY PROJECT ENGINEER

LINE NUMBER	ITEM OR DESCRIPTION OF ITEM, CONTRACT REFERENCE, TYPE OF SUBMITTAL	NO. OF COPIES REQUIRED: BEFORE CONSTR: SHOP DRAWINGS	BEFORE CONSTR: SAMPLES	BEFORE CONSTR: COLOR SELECTION	BEFORE CONSTR: MANUFACTURER'S RECOMMENDATIONS	BEFORE CONSTR: CATALOG DATA	BEFORE CONSTR: OTHER MATERIAL OR DATA	AFTER CONSTR: CERTIFICATION OF COMPLIANCE AND CLOSEOUT	AFTER CONSTR: CLOSEOUT	AFTER CONSTR: MANUFACTURER'S WARRANTY	AFTER CONSTR: OPERATING INSTRUCTIONS	REQUIRED SUBMITTAL DATE	DATE RECEIVED IN CONTRACTING	DATE TO CIVIL ENGR.	RETURN SUSPENSE DATE	FOLLOW-UP	DATE CONTRACTOR NOTIFIED: APPROVED	DATE CONTRACTOR NOTIFIED: DISAPPROVED	CONTRACTOR RESUBMITTAL	FINAL APPROVAL	REMARKS
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NOTE: This Submittal Schedule is for the Contractor's use in assembling and organizing the Submittals to be made to the Government. See individual specification sections for possible additional submittal requirements.

LEGEND:
D-NTP = Design NTP, C-NTP = Construction NTP

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 BARRICADES AND LIGHTS

A. Where the work is constructed in or adjacent to any road, parking area, or public place, the Contractor shall, at his own cost and expense, furnish and erect such barricades, lights, and danger signals, and take such other precautionary measures for the protection of persons and property and of the work, as are necessary. At the completion of construction, all barricades and all traces thereof, shall be removed, holes filled, paving repaired, etc.

1.3 TEMPORARY LADDERS, SCAFFOLDS, HOISTS, ETC.

A. Contractor shall provide and maintain all equipment such as temporary ladders, ramps, scaffolds, hoists, runways, derricks, chutes, etc., as required for the proper execution of the work.

B. All such apparatus, equipment, and construction shall meet all requirements of the Labor Law and other Federal and State Laws applicable thereto.

C. Contractor shall provide, maintain, and remove at completion of work all scaffolding required for the execution of the work. Erect scaffolding on the side of the wall on which work occurs. No scaffolding shall be built into any work.

D. Scaffolding for all other work shall be provided, installed, maintained, and removed at completion of work by the trade requiring such scaffolding.

1.4 STORAGE OF MATERIALS

A. The contractor shall submit a written request with a drawing showing the proposed laydown area for approval through 2 CES leadership.

B. Contractor shall provide, on the premises where directed, suitable storage sheds (substantial and watertight) in which he shall store all materials subject to damage by weather. All storage sheds shall be of sufficient size to hold all materials required on the site at one time, and shall have floors raised at least 6" above the ground on heavy joists or sleepers. Storage sheds shall have neat appearance.

C. Major subcontractors shall provide such temporary buildings as, in the opinion of the Contracting Officer’s Representative, may be necessary to fully protect their materials,

equipment, apparatus, etc., during the progress of the work. Such buildings shall have neat appearance.

D. Building materials, Contractor's equipment, etc., shall be stored on the premises in a manner so that it may be observed at any time by the Contracting Officer's Representative.

E. All materials affected by the weather shall be covered and protected and kept free from damage while being transported to the site.

F. Subcontractors desiring to store materials scheduled for immediate use in the building may do so only in locations as directed by the General Contractor and approved by the Contracting Officer's Representative.

1.5 SANITARY FACILITIES

A. Provide single-occupant, self-contained toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar non-absorbent material. Contractor shall keep such place in sanitary condition and remove at completion of contract. Facility fixtures shall not be used by workmen. Comply with all applicable codes, utility, and safety regulations.

1.6 LAYING-OUT OF WORK

A. Contractor shall compare all drawings and verify all dimensions, and shall take any and all measurements necessary to verify the drawing dimensions in relation to conditions already established at the job site before laying out the work. Contractor will be held responsible for subsequent errors which could have been avoided by such checking.

B. Any discrepancy which will affect the proper layout of the work shall be immediately called to the attention of the Contracting Officer's Representative by the Contractor. No work shall proceed until such discrepancy has been rectified as directed by the Contracting Officer's Representative.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01500

SECTION 01600 - MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract apply to the work specified in this Section. Refer to other Division 1 Sections for additional requirements which may affect the work of this Section.

1.2 RELATED REQUIREMENTS

1.3 GENERAL PRODUCT REQUIREMENTS

A. Provide products, materials, and equipment which comply with the requirements and which are undamaged and unused at the time of installation, and which are complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and for the intended use and effect. Do not use material or equipment for any purpose other than that for which it is designed or specified.

1.4 MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two copies to Contracting Officer’s Representative. Maintain one set of complete instructions at the job site during installation and until completion.

B. Handle, install, connect, clean, condition, and adjust product in strict accord with such instructions and in conformity with specified requirements. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Contracting Officer’s Representative for further instructions. Do not proceed with work without clear instructions.

C. Perform work in accord with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.5 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.

B. Provide equipment and personnel to handle products by method to prevent soiling or damage to products or packaging.

1.6 STORAGE AND PROTECTION

A. Store products in accord with manufacturer's instructions, with seals and labels intact and legible. Store products subject to damage by the elements in weathertight enclosures. Maintain temperature and humidity within the ranges required by manufacturer's instructions. Provide fence with obscuring fabric to encircle all site-stored material.

B. Exterior Storage: Store fabricated products above the ground, on blocking or skids, prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

C. 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.

D. Protection After Installation: Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01600

SECTION 01700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including other Division 1 Specification Sections, apply to work of this Section.

1.2 DESCRIPTION OF REQUIREMENTS

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

B. Specific requirements for individual units of work are included in the appropriate Sections in Division 2 through 16.

1.3 CLOSEOUT SUBMITTALS

A. Submit to Contracting Officer’s Representative for review, four copies each of the following items and other items as specified. Approved copies will be transmitted to Owner by Contracting Officer’s Representative.

B. Operation and Maintenance Data: Refer to Article titled "Operation and Maintenance Manuals" hereinafter this Section.

C. Record Drawings: Refer to "Record Drawings" article hereinafter this section (one copy required).

D. Release of Liens.

E. Consent of Surety to Final Payment.

1.4 OPERATION AND MAINTENANCE MANUALS

A. Purpose: Operation and maintenance manuals will be used for training of, and use by, the Owner and his employees in the operation and maintenance of the systems and related equipment as specified below. A separate manual or chapter shall be prepared for instructions of each class of equipment or system.

B. Contents: Manuals shall contain the following information on each item of equipment:

1. Routine maintenance operations.
2. Complete operating instructions.

3. Service instructions.
4. Complete control wiring.
5. Emergency procedure.
6. Equipment warranties or guarantees.

C. Preparation: The manuals shall be prepared to provide for the optimum operation and maintenance of the various systems outlined above and equipment forming a part of these systems. Manufacturer's literature and data shall be that of the actual equipment installed under contract for the particular facility. Each manual containing the systems noted shall be bound in one or more volumes as required for convenience in handling. In addition to "hard" (paper) copy manuals, provide "electronic files" on CD or DVD in Microsoft® Office or Adobe Acrobat.

D. Quantity: Provide 3 sets of O&M Manuals in D-type, 3 ring binders.

1.5 INSTRUCTIONS

A. Instruct Owner's personnel in operation of all systems, mechanical, electrical, and other equipment in accordance with respective Specification Sections and manufacturer's instructions.

1.6 RECORD DRAWINGS

A. Mark-Up Procedure: During progress of work, maintain a white-print set of Contract Drawings and shop drawings, with mark-up of actual installations which vary substantially from the work as originally shown. Mark whatever drawing is most capable of showing actual physical condition, fully and accurately. Where shop drawings are marked up, cross-reference on contract drawings at corresponding location. Mark with erasable colored pencil, using separate colors where feasible to distinguish between changes for different categories of work at same general location. Mark-up important additional information which was either shown schematically or omitted from original drawings. Give particular attention to information on work concealed, which would be difficult to identify or measure and record at a later date. Note alternate numbers, change order numbers, and similar identification.

B. Submittal: Contractor shall provide as-builts to incorporate all mark-ups to include: one full size hardcopy set on paper; one CD-ROM disk with all drawings sheets in PDF and AutoCAD v2012 (v2009 is acceptable) format. CAD drawings shall have “Bind” command run such that each sheet can stand alone without references or attachments

1.7 CLEANING UP

A. No rubbish shall be allowed to accumulate or be allowed to remain on the premises or job site beyond a reasonable length of time. Trash shall be removed from within the building and from the site daily. Particular attention shall be given to these requirements.

B. All rubbish shall be removed by means of chutes, hoists, or receptacles. Under no circumstances shall any rubbish or waste be dropped or thrown from one level to another within or outside the buildings. Immediately after unpacking materials, all packing case lumber and

other packing materials, excelsior, wrappings, and other like flammable wastes shall be collected and removed from the buildings and premises. Burning of trash on the site will not be permitted.

C. Care shall be taken by all workmen not to mark, soil, or otherwise deface any finishes. In the event that any finishes become defaced in any way by mechanics or workmen, the Contractor or any of his sub-contractors shall clean and restore such surfaces to their original condition.

D. Each subcontractor engaged upon the work shall bear his full responsibility for leaving all work in a clean and proper condition, satisfactory to the Owner and the Contracting Officer's Representative.

E. Final Cleaning: Beside the general broom cleaning, the following cleaning shall be done just before final acceptance of the work:

1. Remove all labels not intended for permanent installation.
2. Remove all marks, stains, fingerprints, and other soil or dirt from all painted work, and clean as required to leave in first class condition.
3. Clean all equipment removing all stains, paint, dirt, and dust.

F. Upon completion of the work, the Contractor will be required to thoroughly clean the building site and surrounding ground, and all trash and rubbish left by him in the course of construction of the work shall be removed and disposed of off the site of work.

G. Contractor shall haul off all debris from the site to legal disposal areas and dispose of all debris and excess materials resulting from project work. No burning of material or debris shall be done at site. In hauling material from the site, it shall be the responsibility of the Contractor to prevent debris from dropping from vehicles and littering the site and any public thoroughfare.

1.8 FINAL INSPECTION

A. Contractor shall submit written certification that:

1. Contract Documents have been reviewed.
2. Project has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in presence of Owner's Representative and are operational.
5. Project is completed, and ready for final inspection.

B. Contracting Officer's Representative will make final inspection after receipt of certification.

C. Should Contracting Officer's Representative consider that work is not finally complete, he will notify the Contracting Officer, in writing, stating reasons.

1.9 FINAL PAYMENT

A. Application for final payment shall be submitted together with documents specified in Section 1.3 of this specification.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01700

SECTION 01710 - CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Throughout the construction period, maintain the buildings and site in a standard of cleanliness as described in this Section.

B. Related Work:

1. Documents affecting work of this section include, but are not necessarily limited to, Sections in Division 1 of these Specifications.
2. In addition to standards described in this Section, comply with requirements for cleaning as described in pertinent other Sections of these Specifications.

1.2 QUALITY ASSURANCE

A. Conduct daily inspection, and more often if necessary, to verify that requirements for cleanliness are being met.

PART 2 - PRODUCTS

2.1 COMPATIBILITY

A. Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

A. General:

1. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage, and providing required protection of materials.
2. Do not allow accumulation of scrap, debris, waste material, and other items not required for construction of this Work.
3. At least twice each month completely remove all scrap, debris, and waste material from the site.

B. Site:

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Weekly, and more often if necessary, inspect all arrangements of materials,

restock if necessary.

C. Structures:

1. Weekly and more often in necessary, inspect the structures and remove all scrap, debris, and waste material.
2. Weekly, and more often if necessary, sweep interior spaces clean.
3. Following the installation of finished floor materials, clean the finish floor daily at all times while work is being performed.
4. Clean all surfaces, interior and exterior, and maintain a reasonably clean structure at all times.

END OF SECTION 01710

SECTION 01732 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of a building or structure.
2. Repair procedures for selective demolition operations.

B. Related Sections include the following:

1. Division 1 Section 01010, "Summary of Work," for use of the premises and phasing requirements.
2. Division 1 Section 01500, "Temporary Facilities," for temporary construction and environmental-protection measures for selective demolition operations.
3. Division 1 Section 01045, "Cutting and Patching," for cutting and patching procedures for selective demolition operations.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

1.6 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.

C. Owner assumes no responsibility for condition of areas to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site will not be permitted.

F. Utility Service: Maintain existing utilities on roof in service unless indicated to be removed and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

G. Notify Contracting Officer’s Representative of discrepancies between existing conditions and drawings before proceeding with selective demolition.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials whose installed performance equals or surpasses that of existing materials.

B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of any items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Contracting Officer’s Representative.

3.2 UTILITY SERVICES

A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.

B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.

1. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
3. Protect existing site improvements, appurtenances, and landscaping to remain.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.

3.4 POLLUTION CONTROLS

A. Dust Control: Use temporary enclosures and other suitable methods to limit spread of dust and dirt.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions.
2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.

B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.5 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining

construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations. Hot work permit required from Base CE/Fire Department prior to this work.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.
10. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.

B. Existing Facilities: Comply with building manager's requirements for using and protecting building facilities during selective demolition operations.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Contracting Officer’s Representative, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 PATCHING AND REPAIRS

A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.

B. Patching: Comply with Division 1 Section 01045, "Cutting and Patching."

C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.

D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

E. Ceilings: Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 01732

SECTION 02762 - DRAINAGE PIPE CCTV INSPECTION

PART 1 - GENERAL

1.1 DESCRIPTION

This item shall consist of the television (CCTV) inspection of drainage pipe within portions of a subsurface drainage collection system as indicated in the drawings, or as directed by the Engineer.

The item shall include, in the bid prices per unit requested, the cost of labor, materials, equipment, and miscellaneous items as are properly required to accomplish: pumping of drainage structures as needed; television inspection of drainage as discussed herein, and provision of logs, records; and provision of CD or DVD discs of all inspections performed.

1.2 LOCATION OF DRAINAGE PIPE

The approximate location of the existing drainage pipe and associated catchbasins are indicated on the drawings. Contractor shall field locate the lines and each catchbasin prior to start of inspection operations.

Owner will provide right of way access along route of drainage pipe designated for inspection. However, in some portions of the pipe route, access may be hindered due to closeness of structures, tree growth or other unintentional hindrances. Contractor shall use all reasonable means to access the pipes and shall notify Owner where access is denied. These portions of route may have to be temporarily skipped until Owner can obtain access or may be eliminated from the inspection operation at the option of Owner.

1.3 SUBMITTALS

Submit a written description of inspection procedures, listing of all equipment to be used, and plan of disposal of removed debris to the Engineer for review and approval prior to beginning inspection operations.

1.4 QUALITY ASSURANCE

A. Comply with all codes, laws, ordinances, and regulations of governmental authorities having jurisdiction over the operations associated with this project. Contractor shall be responsible for obtaining any and all permits as may be required relative to transport and final disposal of removed materials.

B. The intent of the inspection operation is to restore the pipelines' carrying capacity and to facilitate a record of existing drainage condition suitable enough that Owner may determine if line replacement, rehabilitation, point repairs or joint repairs are required. It is recognized that some conditions such as broken pipe and major blockages that prevent or restrict inspection from being accomplished or where additional damage would result if inspection operations are attempted may occur. Should such conditions be encountered, Contractor shall immediately

notify Engineer, note the location and extent of obstructed pipe for future reference, and will not be required to inspect those specific portions under the initial inspection operation.

1.5 COORDINATION

A. Whenever Contractor desires to use a hydrant for water supply, he shall obtain the permission of the Owner. Owner may restrict withdrawal of water to certain locations, time of day, and withdrawal rate. Contractor shall remove connection to hydrant at the end of each day to assure availability of hydrant during unattended periods as well as eliminate occurrences of vandalism or waste of water.

B. Contractor shall provide Owner with a written plan relative to cross-connection protection and shall not connect hoses to Owner's water system until Owner approves the method of connection. Direct connection of hoses between inspection equipment and potable water system is strictly forbidden.

C. Owner will provide water for inspection operations without additional charge to Contractor.

D. Contractor shall completely remove and dispose of extracted material from inspection operations at the end of each day. Contractor shall be fully responsible for sanitary conditions of the site and shall take all actions to eliminate unsightly and/or offensive odor conditions which may be associated with the inspection operation.

PART 2 - PRODUCTS, MATERIALS AND EQUIPMENT

2.1 CCTV CAMERA

The digital video camera used for the inspection shall be one specifically designed and constructed for such inspection work. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. Camera shall be operative in conditions of 100% humidity and/or underwater. Camera shall be capable of spanning 360 degrees circumference and 270 degrees on horizontal axis for inspection of interior surfaces of pipe. Lens shall be of good quality to allow clear views of the surfaces and camera shall include sufficient zoom capability to allow close inspection of suspect areas of the pipe. Focal distance shall be adjustable through a range of one inch to infinity. Video system shall produce picture quality to satisfaction of the Engineer and if unsatisfactory, equipment shall be removed and no payment will be made for an unsatisfactory inspection.

2.2 RECORDINGS

Recordings of all drainage pipe inspections shall be made on DVD or CD discs.

2.3 MEASUREMENT

A footage counter device, which measures the distance traveled by the camera in the drainage pipe, shall be accurate to plus or minus 2 feet in 1000 feet.

2.4 DOCUMENTATION

Digital video equipment shall include genlocking capabilities to the extent that computer generated data (i.e., footage, date, size, location, etc.) can be overlaid onto digital video, and both indicated on the television monitor and permanently recorded on the inspection records.

2.5 MONITOR

The monitor shall be located within a temperature controlled unit that will comfortably accommodate a minimum of 3 people to view the inspection and recording. The monitor shall have a minimum 14 inch viewing screen.

PART 3 - EXECUTION

3.1 CAMERA OPERATION

A. Move the camera through the line at a moderate rate, not to exceed 30 feet per minute, stopping when necessary to permit proper documentation of the pipe's condition. Use manual or powered winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the pipe's condition.

B. Where connection are made with the drainage pipe being inspected , camera is to be stopped and a view of the connection, including interior of connecting pipe, shall be documented.

C. Depth of flow within the line shall not exceed 20% of the inside pipe diameter.

D. Points of interest shall be recorded and shall include, but not limited to, defective joints, ovality, debris, cracked pipes, holes, or blockages.

3.2 RECORDING DATA

A. A continuous uninterrupted recording of distance from the insertion catchbasin shall be visible at the lower left corner of the screen at all times during inspection.

B. The following information shall be recorded and visible onscreen for at least 10 seconds at the start of televising each line segment: Project Name; Catchbasin to Catchbasin Designation (i.e. catchbasin numbers, pipe material, pipe diameter, direction of inspection, etc.); date inspected; and name of contractor.

C. Contractor shall maintain written inspection logs that adequately provide additional clarity to contractor activities and detected defects in the pipe and catchbasin. These shall include catchbasin type, condition, and notes regarding any external conditions that warrant consideration (i.e., poor drainage, inadequate access, etc.). Three copies of these daily inspection logs shall be provided to the engineer.

D. Contractor shall take digital photographs or video stills of any defects or points of interest recorded on the inspection report. If no defects are located within a pipe segment, provide one still image of pipe for informational purposes.

E. A visual recording of all areas of the lines shall be performed and produced in a format that may be replayed in a standard CD/DVD player device. Contractor shall provide three copies of the CD/DVD to the engineer.

F. Videos, photographs, logs, and written reports shall become the property of Owner.

END OF SECTION 02762

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formwork, shoring, bracing, and anchorage.
2. Reinforcement and accessories.
3. Cast-in-place concrete, including new concrete rail slabs.
4. Curing and finishing.
5. Grout, for setting and anchoring items in masonry and concrete.
6. Expansion joint fillers.

B. Related Sections:

1. Construction Drawings.

1.2 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 301 - Specifications for Structural Concrete for Buildings.
2. ACI 304.2R - Placing Concrete by Pumping Methods.
3. ACI 305R - Hot Weather Concrete.
4. ACI 306R - Cold Weather Concreting.
5. ACI 308 - Standard Practice for Curing Concrete.
6. ACI 315 - Details and Detailing of Concrete Reinforcement.
7. ACI 318 - Building Code Requirements for Reinforced Concrete.
8. ACI 347 - Recommended Practice for Concrete Formwork.

B. American Society for Testing and Materials (ASTM):

1. ASTM A82 - Standard Specification for Cold Drawn Steel Wire for Concrete Reinforcement.
2. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
3. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
4. ASTM C31 - Making and Curing Concrete Test Specimens in the Field.
5. ASTM C33 - Concrete Aggregates.
6. ASTM C39 - Compressive Strength of Cylindrical Concrete Specimens.
7. ASTM C42 - Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
8. ASTM C94 - Specification for Ready-Mixed Concrete.
9. ASTM C138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
10. ASTM C143 - Test Method for Slump of Portland Cement Concrete.

11. ASTM C150 - Specification for Portland Cement.
12. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
13. ASTM C172 - Method of Sampling Freshly Mixed Concrete.
14. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
15. ASTM C231 - Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
16. ASTM C260 - Air-Entraining Admixtures for Concrete.
17. ASTM C309 - Liquid Membrane Forming Compounds for Curing Concrete.
18. ASTM C494 - Chemical Admixtures for Concrete.
19. ASTM C881 - Epoxy Resin Base Bonding Systems for Concrete.
20. ASTM D676 - Tentative Method of Test for Indentation of Rubber by Means of a Durometer.
21. ASTM D2240 - Standard Test Method for Rubber Property-Durometer Hardness.

C. American Welding Society (AWS):

1. AWS D1.4 - Structural Welding Code Reinforcing Steel.

D. Concrete Reinforcing Steel Institute (CRSI):

1. CRSI - Manual of Practice
2. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.
3. CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

E. Product Standard (PS):

1. PS 1 - Construction and Industrial Plywood.

F. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M182.
2. AASHTO M73.

1.3 SUBMITTALS

A. Submit mix designs for each type concrete for use. See individual sections of these specifications for requirements.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Concreting: Perform work in accordance with ACE 306R during cold weather concreting operations.

1. Comply with the following for minimum temperature of concrete delivered to job site:
   a. Air Temperature 30-45°F: Concrete temperature 60°F minimum.
   b. Air Temperature 0-30°F: Concrete temperature 65°F minimum.
   c. Air Temperature below 0°F: Concrete temperature 70°F minimum.

d. The maximum concrete temperature shall not exceed the minimum required temperature by more than 10°F.

2. Combine water heated to above 100°F with aggregates before cement is added. Do not add cement to water or aggregates having temperature greater than 100°F.
3. When temperatures of 40°F or lower occur during the placing and curing of concrete, maintain temperature of concrete at not less than 55°F for at least 3 days.
   a. Make arrangements before placement to maintain required temperature without damage from excessive heat.
   b. Do not use combustion heaters during first 48 hours without precautions to prevent exposure of concrete to exhaust gases containing carbon dioxide and carbon monoxide.
4. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with the requirements of ACI 306R and as herein specified.
5. When the air temperature has fallen to or is expected to fall below 40°F, provide adequate means to maintain the temperature of the plastic concrete as placed, at 55°F minimum, for at least 3 days. Provide temporary housings or coverings including tarpaulins or plastic film. Keep protection in place and intact at least 24 hours after artificial heat is discontinued. Avoid rapid dry-out of concrete due to overheating, and avoid thermal shock due to sudden cooling or heating.
6. Do not use frozen materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Ascertain that forms, reinforcing steel, and adjacent concrete surfaces are entirely free of frost, snow, and ice and temperature of these materials is above 32°F before placing concrete.
7. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators.

B. Hot Weather Concreting: Perform work in accordance with ACI 305R.

1. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305R and as herein specified.
2. Temperature of concrete at time of placing shall not exceed 90°F. Contractor shall maintain an accurate reading thermometer at the job site to check temperature of concrete. Concrete shall be rejected before placing if temperature of concrete exceeds 90°F.
3. Special precautions to protect fresh concrete before and during finishing shall be mandatory when the rate of evaporation of surface moisture from concrete exceeds 0.2 pounds per square foot per hour. Rate of evaporation shall be determined in accordance with ACI 305R. Special precautions shall be provided as required:
   a. Cool ingredients before mixing to reduce concrete temperature at time of placement. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water.
   b. Dampen subgrade and forms.
   c. Cover reinforcing steel with water-soaked burlap so the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

PART 2 - PRODUCTS

2.1 FORMWORK

A. Design, engineer and construct forms, shores, bracing, and other temporary supports to support loads imposed during construction, in accordance with ACI 347. Design under the direct supervision of a licensed professional engineer experienced in design of this Work.

1. Plywood: PS 1, sound, undamaged sheets with straight edges.
2. Lumber: Construction grade.
3. Steel: Minimum 16 gage sheet, well matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
4. Carton Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete until initial set.

B. Accessories:

1. Form Ties: Removable or snap-off metal, of fixed or adjustable length as applicable, with cone ends.
2. Form Release Agent: Colorless mineral oil which will not stain concrete.
3. Waterstops: Select one of the following.
   a. Volclay RX-101
   b. Synko-Flex

2.2 REINFORCEMENT

A. Reinforcing Steel: ASTM A615; 60 ksi yield grade billet-steel deformed bars, uncoated finish.

B. Welded Steel Wire Fabric: ASTM A185 plain type. Provide mats for welded wire fabric with wire sizes larger than W2.9.

2.3 REINFORCEMENT ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete.

2.4 CONCRETE MATERIALS

A. Cement: ASTM C150, normal - Type I.

B. Fine and Coarse Aggregate: (ASTM C33) Use maximum coarse aggregate size per ACI 301, but not larger than 1-1/2 inches. Meet the following grading requirements of fine aggregates.

Sieve	Percent Passing

3/8 inch	100
#4	95 - 100
#8	80 - 90
#16	50 - 75
#30	30 - 50
#50	10 - 20
#100	2 - 5

C. Water: Clean potable water, not detrimental to concrete.

2.5 CHEMICAL ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Chemical Admixtures: ASTM C494; Type A - water reducing.

1. Admixtures containing Thyocyanates, Calcium Chloride or more than 0.1 percent chloride ions are not permitted. Admixtures shall not contain more corrosives than are present in municipal drinking water.
2. The maximum water soluble chloride ion content in hardened concrete at 28 days shall not exceed 0.15 percent by weight of cement.

C. Obtain Contracting Officer Representative's written approval prior to the use of any other admixtures.

2.6 RELATED MATERIALS

A. Non-shrink Grout: Pre-mixed non-shrinking, high strength grout, COE CRD-621; compressive strength of 5000 psi in 28 days.

1. Masterflow 713 by Master Builders Co.
2. Gilco Construction Grout by Cormix Construction Chemicals, Dallas, TX, (800) 869-0300. (Formerly Gifford-Hill Co.)
3. Crystex by L&M Construction Chemicals, Inc.
4. Euco-N-S Grout by Euclid Chemical Company.
5. Sonogrout by Sonneborn Building Products.

B. Epoxy Bonding Agent: ASTM C881.

1. Concresive 1001 LPL by Adhesive Engineering Co.
2. Uniweld by Permagile.
3. EVA-POX HI MOD GEL #23 by E-Poxy Industries, Inc.
4. Similar product by other manufacturers; submit name, compressive strength and tensile strength for acceptance.

2.7 CONCRETE CURING MATERIALS

A. Chemical Cure for Slabs: Kure-N-Seal by Sonneborn Building Products, ASTM C309.

B. Moisture Cure:

1. Water: Potable.
2. Moisture-retaining Coverings: Burlap, cotton mats, or other moisture-retaining fabrics; AASHTO M182, ASTM C171, or AASHTO M73. Provide burlap free if sizing; rinse thoroughly in caustic soda to remove soluble substances and make burlap more absorbent.

2.8 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94.

B. Provide concrete with the following characteristics:

1. Compressive Strength: As specified or indicated for the specific use.
2. Air Content: 5%, plus or minus 1%.
3. Slump for conventionally placed concrete: Not to exceed 4 inches, maximum.
4. Slump for pumped concrete: Not to exceed 4 inches at the point of discharge from the pipe or hose after pumping.
5. Maximum Water-Cement Ratio: 0.46.
6. Minimum Cement Content: 493.5 lbs. per cu. yd.

C. Admixtures:

1. Air Entraining Admixtures: ASTM C260. Add to concrete mix for concrete work subject to freeze-thaw cycling. Air Content: See above.
2. Water Reducing Admixtures: ASTM C494, Type A. Use at interior slabs on grade, at Contractor's option and when approved by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's instructions. Do not apply bonding agent at slab-on-grade construction joints.

3.3 PLACING REINFORCEMENT

A. Perform concrete reinforcement work in accordance with CRSI Manual of Standard Practice, Documents 63 and 65.

1. Accurately place and secure saddle ties at every other intersection with 16 gage black annealed wire; hold rigidly in place with metal chairs or spacers during placing of concrete.

2. Hold bars in beams and slabs to exact location during concrete placement. Use spacers, chairs, or other necessary supports with the following tolerances:
   a. Bars in Slabs and Beams:
      1) Members 8 Inches Deep or Less: 1/4 inch.
      2) Members 8 Inches to 2'-0" Deep: 1/2 inch.
      3) Members More than 2'-0" Deep: 1 inch.

B. Welded Reinforcement (AWS D1.4): Do not weld reinforcement in the shop or field.

3.4 PLACING CONCRETE

A. Notify Testing Laboratory minimum 24 hours prior to commencement of concreting operations.

B. Place concrete in accordance with ACI 301; including hot and cold weather placement procedures.

C. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.

D. Place concrete in reasonably uniform layers, approximately horizontal, 12 to 18 inches thick, exercising care to avoid vertical joints or inclined planes. Place concrete continuously between predetermined construction joints shown on structural drawings. Piling up of concrete in forms to cause separation or loss of ingredients is not permitted.

E. Do not deposit concrete which has partially set or hardened. Do not deposit initial lubricating mortar when pumping concrete. Remove hardened or partially hardened concrete which has accumulated on forms or reinforcement. Do not place concrete on previously deposited concrete which has hardened sufficiently to cause formation of seams or planes of weakness within respective member or section except as specified.

F. Deposit concrete as nearly in final position as practical to avoid rehandling. Exercise care to prevent splashing forms or reinforcing with concrete. Do not permit concrete to drop freely a distance greater than 3 feet. Where longer drops are necessary, use chute, tremie, or other conveyance to help avoid separation.

G. Do not deposit concrete into excavation where water is standing. If place of deposit cannot be successfully pumped dry, place through tremie with outlet end near bottom of place of deposit.

H. Do not deposit concrete when plasticity, measured by slump test, is outside specified limits.

I. Consolidate and screed concrete slabs-on-grade by use of vibratory screed of size to allow construction joint patter as indicated on Structural Drawings and specified.

J. Vibration: As soon as concrete is deposited, thoroughly agitate with mechanical vibrators and suitable hand tools to work mixture into corners of forms and around reinforcing and embedded items. Use mechanical vibrators to transport concrete within forms. Insert and withdraw vibrators at approximately 18 inches apart. At each insertion, vibrate generally 5-15 seconds, sufficient to consolidate concrete but not long enough to cause segregation. Keep spare vibrator on job site during concrete placement operations. Do not insert vibrator into lower courses that have begun to set.

K. Excessive honeycomb or embedded debris in concrete is not acceptable.

L. Pumping: Maintain controls for proportioning, mixing, adjustment of mix and placement in accordance with ACI 301 and ACI 304.2R.

3.5 FORM REMOVAL

A. Do not remove forms until concrete has attained sufficient strength. Clamps or tie rods may be loosened 24 hours after concrete is placed. Ties, except for sufficient number to hold forms in place, may be removed at that time.

B. Minimum Curing Period Prior to Form Removal:

1. Air Temperature: Above 60°F: 3 days.
2. Air Temperature: 50°F to 60°F: 5 days.
3. Air Temperature: 40°F to 50°F: 7 days.
4. Air Temperature: Less than 40°F: When temperature below 40°F prevails, leave forms until concrete reaches 75% of 28-day design strength.

C. Observance of minimum curing periods listed above does not relieve Contractor of responsibility for safety of structure during construction.

3.6 FINISHING

A. Schedule of Finishes:

1. Unexposed Exterior Formed Surfaces: Rough form finish.
2. Exposed Exterior Formed Surfaces: Rubbed/stoned.
3. Sidewalks: Light broom.
4. Ramps and Steps: Heavy broom.

B. Initial Working:

1. Remove surface irregularities with bull float before water appears on concrete surface.
2. Do no further working of surface until time for floating; do not work surface while water is present.
3. "Dry Sprinkle" method finishing is not acceptable and will be cause for rejection.

C. Floating:

1. Begin float operations when bleed water sheen has disappeared and concrete has stiffened sufficiently to allow walking on surface without leaving heel prints more than 1/4 inch deep. Use magnesium or aluminum power float.
2. Premature finishing brings excessive fines to surface and causes finished slab to have soft surface which will dust.

D. Troweling:

1. Delay troweling as long as possible to prevent working excess fines and water to surface. Do not begin until surface moisture film and shine remaining after floating have disappeared.
2. Power trowel where possible; use hand trowel in inaccessible areas.
3. Do not over-trowel Stockroom floor. Slab must be able to accept specified floor treatment. Coordinate with floor treatment manufacturer's application instructions for proper finish and for procedures when finish is too dense for proper floor treatment application.
4. Do not re-wet surface to trowel.

E. Provide ACI "Class A" tolerance; 1/8 inch variation in 10 feet, measured with straight edge laid in

any direction.

3.7 CURING

A. Chemical Cure for Slabs (ACI 308): Apply in accordance with manufacturer's single coat application instructions. Obtain from the curing compound manufacturer a written guarantee that the compound will not be detrimental to bonding of flooring adhesives or surface materials. This guarantee shall be submitted to the Owner at the time request is made for use of curing compound.

B. Moisture Cure: Moisture curing method is optional for all areas.

1. Place wet, moisture-containing fabric covering as soon as concrete has hardened sufficiently to prevent surface damage.
2. Cover entire surface, including edges of slabs such as paving or sidewalks.
3. Keep coverings continually moist so that a film of water remains on concrete surface throughout curing period.
4. Maintain concrete in moist condition for not less than seven days after placement.

3.8 DEFECTIVE CONCRETE

A. Modify or replace concrete not confirming to required strength, levels and lines, details and elevations.

B. Repair or replace concrete not properly placed or of the specified type.

C. Do not impair appearance or strength of structure in removal or replacement procedures.

3.9 FIELD QUALITY CONTROL

A. Testing as indicated in Section 01410.

B. Provide and pay for the following:

1. Qualification of proposed materials and establishment of mix designs in accordance with ACI 318.
2. Testing services needed or desired by Contractor for his purposes.

C. Evaluation and Acceptance:

1. Strength level of concrete will be considered satisfactory if the average of all sets of three consecutive strength tests equal or exceed specified strength and no individual strength test (average of two cylinders) results are below specified compressive strength by more than 500 psi.
2. Complete concrete work will not be accepted unless requirements of ACI 301, Chapter 18, have been complied with.
3. Where average strength of cylinders, as shown by tests, falls below minimum ultimate compressive strength specified, Owner reserves the right to require Contractor to provide improved curing conditions of temperature and moisture to secure required strength. If average strength of laboratory control cylinders should fall so low as to cause portions of structure to be in question by Owner, Contractor shall follow core procedure set forth in

ASTM C42. If results of core test indicate that strength of structure is inadequate, removal or replacement may be ordered by Owner and shall be provided by Contractor without additional cost to Owner. If core tests are so ordered and results of such tests disclose that strength of structure is as required by provisions of Specifications and Drawings, cost of test will be borne by Owner.

3.10 PROTECTION

A. Protect finished work.

B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

3.11 CLEANING

A. Remove forms, equipment, protective coverings, and rubbish resulting from concreting operations. Leave finished concrete surfaces in clean conditions.

END OF SECTION 03300

SECTION 05120 – STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: Bidding and/or Negotiations Requirements, General Conditions of the Contract, Supplementary Conditions, pertinent portions of sections in Division 1 of the Project Specifications and the Drawings shall apply to the Work of this Section.

1.2 WORK INCLUDED

A. Scope: Provide structural steel framing as indicated on Drawings and as specified herein.

1.3 RELATED WORK

A. General: Following items of related work are included in other sections:

1. Cast-in-Place Concrete: Section 03300.
2. Metal Fabrications: Section 05500.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

1. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" including the "Commentary" and Supplements thereto as issued.
2. AISC "Specifications for Structural Joints using ASTM A-325 or A-490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
3. AWS D1.1 "Structural Welding Code."
4. ASTM A-6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

1.5 SUBMITTALS

A. General: Submit in accordance with requirements of Section 01400 - "Submittals."

B. Schedule: Upon award of Contract, prepare Shop Drawings of structural steel, based on design drawings, for approval of Contracting Officer's Representative.

C. Shop Drawings: Give necessary information for fabrication, erection, painting of structural steel based on AISC specifications. Furnish Shop Drawings that have been checked prior to submittal. Do not fabricate until approved drawings are in hands of Fabricator. All structural shop drawings should be submitted with a P.E. stamp.

D. Details: Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.

1.6 SUBSTITUTIONS

A. General: For products specified herein, Bids shall be based on products named in Project Manual, or on items which Architect has designated as an "approved equal." A product not named in Project Manual or that is not approved by Architect will only be acceptable when such product meets all other requirements of Project Specifications, including specifications of originally specified products' manufacturer as of date of Contract Documents.

B. Requests for Substitutions: Requests for Contracting Officer's Representative's approval of a product as equal will not be considered unless sufficient data for evaluation is received by Contracting Officer's Representative seven (7) days prior to the Bid Opening Date.

C. Submittals: Submit a separate request for each Product in accordance with requirements of Section 01640 - "Substitutions and Product Options."

D. Note: Contracting Officer's Representative's or Owner's approval of an item for a previous project does not constitute approval for this Project.

1.7 DELIVERY, STORAGE AND HANDLING

A. Note: Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay that work.

B. Storage: Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

C. Precautions: Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials as directed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel Shapes and Channels: ASTM A-992 or ASTM A-572, Grade 50.

B. Structural Steel Plates, Bars and Angles: ASTM A-36.

C. Cold-Formed Steel Tubing: ASTM A-500; Grade B.

D. Steel Pipe: ASTM A-53, Type E or S, Grade B.
E. Steel Castings: ASTM A-27, Grade 65-35, medium-strength carbon steel.

F. Anchor Bolts: ASTM A-307, nonheaded type unless otherwise indicated.

G. Unfinished Bolts: Bolts less than 3/4 inch, use bolts comply with ASTM A-307, Grade A.

H. High-Strength Bolts: Bolts 3/4 inch and larger, use bolts that comply with ASTM A-325 manufactured with "Break-Off Tip" for tension indication.

I. Electrodes for Welding: Comply with AWS Code and ASTM A-233, E70 shop welds; E60 field welds.

J. Structural Steel Primer Paint: Rust-inhibitive modified alkyd primer, Tnemec Primer Number 10-99, Red.

K. Non-Metallic Shrinkage Resistant Grout: Corps of Engineers CRD-C621, pre-mixed factory-packaged non-metallic shrinkage-resistant grouting compound.

1. Grout Products: Provide shrinkage-resistant grout: Masterflow 713 by Master Builders; Sealtight 588 by W. R. Meadows; or approved equal.

2.2 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.

B. Field Erection Marking System: Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

C. Shop Painting: Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

D. Shop Connections: Weld or bolt shop connections, as indicated. Joint design and preparation shall be in strict accordance with requirements of AWS and AISC for prequalified joints.

E. Note: Do not shop splice columns or beams unless approved in writing by Contracting Officer’s Representative.

F. Field Connections: Bolt field connections, except where welded connections or other connections are indicated and as follows:

1. Provide high-strength threaded fasteners for principal and 3/4 inch and larger connections.
2. Provide unfinished threaded fasteners for only bolted connections of secondary framing members to primary members and for less than 3/4 inch bolted connections.

G. High Strength Bolts: Identification mark on bolt head, Project structural design permits threads in shear plane.

H. Column Base: Milled or saw cut.

I. Joist Tie Connection Angles and Plates: As indicated and detailed on Drawings, shall be furnished and connected in shop by fabricator.

2.3 SHOP PAINTING

A. Painting Requirements: No shop painting will be required except where plans indicate that structural steel will be exposed to weather, e.g. cooling tower framing, door lintels, screen walls, etc.

B. Surface Preparation: Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) SP-3 "Power Tool Cleaning."

C. Painting: One coat of approved primer applied by brush, spray, roller or dip to produce a dry film thickness of not less than 2 mils.

D. Note: Do not shop paint when temperature is below 45 degrees F., or when steel temperature is below dew point of atmosphere or on wet surfaces.

PART 3 - EXECUTION

3.1 INSPECTION

A. General: Erector must examine areas and conditions under which structural steel work is to be installed, and notify Contractor and Contracting Officer's Representative in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Erector.

3.2 ERECTION

A. General Erection: Comply with AISC "Specification for the Design, Fabrication, & Erection of Structural Steel for Buildings" and AISC "Code of Standard Practice."

B. Field Connections: Bolted or welded as indicated on Drawings and as follows:

1. Welded Connections: By operators qualified as specified herein, with direct current equipment.
2. Bolted Connections: Tighten A325 bolts to a minimum of 70 percent full tension as indicated by tip break-off as specified by AISC, except where noted otherwise on Drawings. Enter all bolts from same side of connection.

C. Bearing Plates: Set on steel shims to clear masonry construction, grout one and one-half (1-1/2) inches or as indicated on Drawings.

D. Plumb, Level Tolerance: Comply with AISC "Code of Standard Practice."

E. Temporary Bracing: As required to secure framing against wind, seismic, erection loads. Bracing shall remain in place until floor, roof, walls are secured to framing except where such elements are not required for stability of framing.

F. Method for Correction of Errors: Methods shall require approval of Contracting Officer's Representative.

END OF SECTION 05120

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide miscellaneous metal work shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. The work required under this Section consist of, but not limited to, all header angles, clop angles, bridging, bracing, and other metal as indicated or intended.

C. All reference to standard specifications ASTM, AISC, and AWS shall refer to the latest revisions of amendments thereof.

D. Related work:

1. Documents affecting work of this Section include, but are not necessary limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
2. Section 09900: Painting

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01600.

1.4 SHOP DRAWINGS

A. Provide shop drawings which completely define type, position of, anchorage, finish of, and any incidentals relative to products specified in this Section and/or referenced in other Sections of this Specification. Shop drawings shall be inclusive of details, special instructions, dimensions, and procedure for installation of all components utilized in the Work intended by this Section of the Specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All steel shall be new material conforming to the requirements of ASTM specifications A-992, latest amendment.

B. In fabricating items which will be exposed to view, limit materials to those which are free from surface blemishes, pitting, rolled trade names, and roughness.

2.2 FASTENERS

A. General:
1. For exterior use and where built into exterior walls, provide zinc-coated fasteners.
2. Provide fasteners of type, grade, and class required for the particular use.

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect/Engineer.

2.4 SHOP PAINT

A. Primer: Use "10-99 Tnemec Primer" or "Rustoleum Number 5769 Primer."

B. For repair to galvanizing, use a high zinc-dust content paint complying with MIL-P-21035.

2.5 FABRICATION

A. Except as otherwise shown on the Drawings or the approved Shop Drawings, use materials of size, thickness, and type required to produce reasonable strength and durability in the work of this Section.

B. Fabricate with accurate angles and surfaces which are true to the required lines and levels, grinding exposed welds smooth and flush, forming exposed connections with hairline joints, and using concealed fasteners wherever possible.

C. Prior to shop painting or priming, properly clean metal surfaces as required for the applied finish and for the proposed use of the item.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
1. Set work accurately into position, plumb, level, true, and free from rack.

2. Anchor firmly into position.
3. Do not cut, weld, or abrade surfaces which have been hot-dip galvanized after fabrication and which are intended for bolted or screwed field connections.

B. Immediately after erection, clean the field welds, bolted connections, and abraded areas of shop priming. Paint the exposed areas with the same material used for shop priming.

END OF SECTION 05500

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Thermal unfaced batt insulation.

B. Rigid insulation.

C. Unfaced sound batt insulation.

D. Fire stopping at gaps and at top of walls or around wall or floor penetrations.

E. Refer to drawings and Schedule at end of this section for location and type.

1.2 RELATED SECTIONS

A. Section 08340 – Steel Sliding Hangar Doors.

1.3 REFERENCE STANDARDS

A. ASTM C 665 – Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

B. ASTM C 578 – Specification for Rigid, Cellular Polystyrene Thermal Insulation.

C. ASTM C 1289 – Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

D. ASTM E 84 – Test Method for Surface Burning Characteristics for Building Materials.

E. ASTM E 119 – Test Method for Fire Tests of Building Construction Materials.

1.4 SYSTEM DESCRIPTION

A. System performance to provide continuity of thermal, sound. and vapor barrier at building enclosure elements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Thermal Batt Insulation:

1. Celotex Corporation.
2. CertainTeed.
3. Manville Commercial Building Insulation.
4. Owens-Corning Fiberglas Insulation
5. USG Interiors, Inc.
6. Paroc Basalt Insulation

B. Sound Attenuation Batt Insulation:

1. Celotex Corporation.
2. CertainTeed.
3. Manville Commercial Building Insulation.
4. Owens-Corning Fiberglas Insulation
5. Paroc Basalt Insulation
6. USG Interiors, Inc.

C. Fire Stop Insulation:

1. The Carborundum Company.
2. Thermal Ceramics.
3. Dow Corning Firestop System.
4. USG Firestop System.

D. Rigid Insulation (Polystyrene and Polyisocyanurate):

1. Celotex Corporation
2. CertainTeed
3. Manville Commercial Building Insulation
4. Owens-Corning
5. USG Interiors, Inc.
6. Paroc Basalt Insulation

2.2 MATERIALS

A. Thermal Batt Insulation - Unfaced

1. ASTM C 665, Type I, Class A:

B. Sound Attenuation Batt Insulation:

1. ASTM C 665. Type I, Class A and ASTM C 136. batt insulation:

C. Rigid Insulation:

1. ASTM C 1289, polyisocyanurate insulation:

D. Fire Stop Insulation:

1. ASTM C 665. Type I, Class A and ASTM C 612, Type I. Class A for ASTM E 812 as follows:
   a The Carborundum Company: FiberFrax Insulation with Fyre Putty High-Temperature Ceramic Caulk Firestop material.
   b. Thermal Ceramics FireMaster blanket insulation with FireMaster Putty.
   c. Dow Corning Firestop Foam, Non-Combustible Ceramic or mineral wool insulation or Firestop Intumenscent Wrap Strip with Firestop Sealant.
   d. USG Thermafiber Safing Insulation with Firecode Compound.

2.3 ACCESSORIES

A. Insulation Fasteners: Galvanized steel wire nails or staples of type and size to suit application.

B. Tape: Metallic, as recommended by manufacturer for the type of vapor barrier membrane provided.

C. Fire Stop Insulation accessories as recommended by manufacturer.

2.4 SUBMITTALS

A. Submittals shall be in accordance with Section 01400.

B. Product Data: Submit manufacturer's product data including installation instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate and adjacent materials are dry and ready to receive insulation.
B. Verify that insulation baffles are in place prior to installation of attic insulation.

3.2 INSTALLATION - BATT INSULATION

A. Install insulation in accordance with insulation manufacturer's instructions. Fit insulation tight in spaces. Leave no gaps or voids.

B. Install thermal batt insulation in ceilings without gaps or voids.

C. Install friction fit insulation tight to framing members in attic spaces.

END OF SECTION 07210

SECTION 07420 - FORMED METAL LINER PANELS

PART 1 - GENERAL

1.1 Description of Work

A. This section covers the pre-finished, pre-fabricated exposed fastener metal wall system. All metal trim, accessories, fasteners, insulation and sealants indicated on the drawings as part of this section.

B. Drawings and general provisions of the Contract, including general and Supplementary Conditions and Division 01 Specifications, apply to this section.

1.2 Summary

A. Section Includes:

1. Factory formed exposed fastener metal wall panels.

B. Related work specified elsewhere:

1. Section 05120 - Structural Steel Framing
2. Section 05400 - Cold-Formed Metal Framing
3. Section 07620 - Sheet Metal Flashing and Trim
4. Section 08340 - Steel Sliding Hangar Doors

1.3 Definitions

A. Metal Wall Panel Assembly: Metal panels, attachment system components, miscellaneous metal framing, thermal, and accessories necessary for a complete weathertight wall panel system.

1.4 Quality Assurance

A. Manufacturer and erector shall demonstrate experience of a minimum of five (5) years in this type of project.

B. Panels shall be factory-produced only. No portable, installer-owned or installer-rented machines will be permitted.

C. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

1.5 Substitutions

A. The material, products and equipment specified in this section establish a standard for required function, dimension, appearance and quality to be met by any proposed substitution.

1.6 Wall System Performance Testing

A. General Performance: Metal wall panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation or other defects in construction.

B. Panels to meet:

1. Wall System shall be designed to meet applicable Local Building Code and the Soffit System shall have been tested by the Manufacturer per ASTM E330 and have the applicable Load Tables published from this Air Bag testing for negative loads.

1.7 Submittals

A. Furnish detailed drawings showing profile and gauge of exterior sheets, location and type of fasteners, location, gauges, shape and method of attachment of all trim locations and types of sealants, and any other details as may be required for a weather-tight installation.

B. Provide finish samples of all colors specified.

Shop drawings: Show fabrication and installation layouts of metal wall panels or metal soffit panels, details of edge conditions, side-seam joints, panel profiles, corners, anchorages, trim, flashings, closures and accessories, and special details. Distinguish between factory and field-assembled work.

1.8 Delivery, Storage and Handling

A. Ordering: Comply with manufacturer’s ordering instruction and lead time requirements to avoid construction delays.

B. Deliver components, sheets, metal wall panels and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

C. Unload, store and erect metal wall panels in a manner to prevent bending, warping, twisting and surface damage.

D. Stack metal wall panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness. Do not store metal wall panels in contact with other materials that might cause staining, denting or other surface damage.

E. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.

1.9 Project Conditions

A. Weather Limitations: proceed with installation only when existing and forecasted weather conditions permit metal wall panel work to be performed.

B. Field Measurements: Verify actual dimensions of construction contiguous with metal wall panels by field measurements before fabrication.

1.10 Coordination

A. Coordinate sizes and locations of wall penetrations with actual equipment provided.

B. Coordinate metal wall panels with rain drainage work, flashing, trim and construction of decks, parapet walls and other adjoining work to provide a leakproof, secure and noncorrosive installation.

PART 2 - PRODUCTS

2.1 Panel Design

A. General: Provide factory-formed metal wall panels designed for wall, soffit and fascia applications where a flush or flat appearance is desired. A round interlock leg and concealed fastening system act to improve the flush appearance while providing additional strength.

B. Wall panels shall be flush panel in min. 16” coverage widths.

C. Panels to be produced smooth.

D. Forming: Use continuous end rolling method. No end laps on panels. No portable rollforming machines will be permitted on this project, no installer-owned or installer-rented machines will be permitted. It is the intent of the Architect to provide Factory-Manufactured panel systems only for this project.

2.2 Acceptable Manufacturers

A. This project is detailed around the siding product, Reynolux 4HC of Alcoa Architectural Products. Other manufacturers that meet the criteria of this specification are acceptable.

2.3 Materials and Finishes

A. Preformed metal panels shall be fabricated of 0.040” thick 3105-H14 aluminum.

B. Color shall be chosen by Owner from manufacturer’s list of standard colors.

C. Finish shall be Kynar 500 or Hylar 5000 Fluorocarbon coating with a top side film thickness of 0.70 to 0.90 mil over a 0.25 to 0.3 mil prime coat to provide a total dry film thickness of 0.95 to 1.25 mil, to meet AAMA 2605 or AAMA 621. Bottom side shall be coated with a primer with a

dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesions, flexibility and longevity as specified by Kynar 500 or Hylar 5000 finish supplier.

D. If Strippable coating to be applied on the pre-finished panels to the top side to protect the finish during fabrication, shipping and handling, film shall be removed before installation.

E. Trim: Trim shall be fabricated of the same material and finish to match the profile, and will be press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer of their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting.

F. Accessories/Fasteners: Fasteners shall be of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous framing members to substrates. Accessories and their fasteners shall be capable of resisting the specified design wind uplift forces and shall allow for thermal movement of the wall panel system. Exposed fasteners shall not restrict free movement of the wall panel system resulting from thermal forces, except at designed points of wall panel fixity

G. Underlayment:

1. On all surfaces to be covered with metal wall panels, furnish and install a 40 mil “Peel & Stick membrane”, required as outlined by metal panel manufacturer. Membrane to be a minimum of 40 mil thickness, smooth, non-granular, by one of the following manufacturers:
   a. W.R Grace “Ice & Water Shield”
   b. Cetco Strongseal
   c. Carlisle CCW WIP 300HT
   d. Interwrap Titanium PSU
   e. MFM Corp “Wind & Water Shield”
   f. Polyguard Deck Guard HT of Polyglas HT
   g. Tamko TW Tile and Metal Underlayment

2.4 Sealants

A. Provide two-part polysulfide class “B” non-sag type for vertical and horizontal joints, brand name: NP-1. Geocell 2300, Weathermaster “Titebond” or similar performing caulking.

B. One part polysulfide not containing pitch or phenolic extenders, or;

C. Exterior grade silicone sealant recommended by wall panel manufacturer, or;

D. One part non-sag, gun grade, exterior type polyurethane recommended by wall panel manufacturer.

2.5 Fabrication

A. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown, provide manufacturer’s standard product fabrication.

B. Fabricate components of the system in factory, ready for field assembly.

C. Fabricate components and assemble units to comply with fire performance requirements specified.

D. Apply specified finishes in conformance with manufacturer's standard, and according to manufacturer's instructions.

PART 3 - EXECUTION

3.1 Inspection

A. Examine alignment of structural steel and related supports, primary and secondary wall framing, solid wall sheathing, prior to installation. Components should comply with shop drawings and be smooth, even, sound and free of depressions.

B. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.

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

3.2 Fasteners

A. Secure units to supports.

B. Place fasteners as indicated in manufacturer's standards.

3.3 Installation

A. Compliance: Comply with manufacturer's product data, recommendations and installation instructions for substrate verification, preparation requirements and installation.

B. Panels shall be installed plumb and true in a proper alignment and in relation to the structural framing. The erector must have at least five years' successful experience with similar applications.

C. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight installation.

D. Provide uniform, neat seams.

E. Fasteners: Conceal fasteners where possible in exposed work. Cover and seal fasteners and anchors for watertight and leakproof installation.

F. Remove all strippable coating and provide a dry-wipe down cleaning of the panels as they are erected.

3.4 Damaged Material

A. Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and Owner.

3.5 Cleaning

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damage installed products. Clean installed products in accordance with manufacturer's instruction prior to Engineer's or Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 07420

SECTION 08340 - STEEL SLIDING HANGAR DOORS

PART 1 GENERAL

1.1 REFERENCES

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

A. AISC 335 Structural Steel Buildings Allowable Stress Design and Plastic Design

B. AISI SG-973 Cold-Formed Steel Design Manual

C. ASTM A 36/A 36M Carbon Structural Steel

D. ASTM A 366/A 366M Commercial Steel (CS) Sheet, Carbon, (0.15 Maximum Percent) Cold-Rolled

E. ASTM A 569/A 569M Commercial Steel (CS) Sheet and Strip, Carbon (0.15 Maximum, Percent), Hot-Rolled

F. ASTM A 653/A 653M Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

G. ASTM C 920 Elastomeric Joint Sealants

H. NEMA ICS 1 Industrial Control and Systems

I. NEMA ICS 2 Industrial Control and Systems Controllers, Contactors and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC

J. NEMA ICS 6 Industrial Control and Systems Enclosures

K. NFPA 70 National Electrical Code

L. SSPC SP 6 Commercial Blast Cleaning

M. SSPC Paint 25 Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments)

N. UL 506 Specialty Transformers

1.2 DESIGN REQUIREMENTS

A. Door Design:

The hangar doors shall be repaired by the manufacturer in accordance with the criteria specified. The existing hangar doors shall be comprised of two (2) individually motor operated hangar door systems consisting of eleven (11) panels each for openings of approximately 380’-0” wide by 63’-0” high. After repair, the new hangar door systems will consist of (2) hangar door systems which are motor operated in 3 groups, consisting of ten (10) panels each with openings of approximately 372’-0” wide by 63’-0” wide. Each new system will consist of (2) anchored door groups (3 doors each), as well as (1) floating door group (consisting of 4 doors). Doors shall operate without

binding, interference, or damage to weatherstripping. Doors shall fit closely and be free from warping.

B. Steel Design:

AISC 335, AISI SG-973.

C. Loading:

Design doors as a system to withstand an external wind load of 20 pounds per square foot (psf) or the design wind load indicated for the building, whichever is greater, and an internal wind load of not less than one-half of the external wind load. In both cases, the deflection shall not exceed the height of the door divided by 120. The deflection due to design wind load shall not exceed length divided by 120 for any door member. Fiber stresses due to combined dead load and wind load shall not exceed the recommended design stresses for the material used and type of loading sustained.

D. Deflection:

Design doors as a system to withstand the upward and downward deflections of the structure supporting and bracing the top of the hangar door system.

E. Connections:

Design connections at top and bottom guide rails to withstand an external and an internal wind load of not less than 33 psf or the design wind load for the building, whichever is greater, and a seismic load equal to 0.5 times the weight of the door.

F. Cold-Formed Steel Members:

Cold-formed steel main members and girts shall be not less than ¼ " thick.

1.3 SUMMARY OF WORK

A. Contractor shall provide the following for each of the (2) hangar door systems:

1. Replace all existing windows with insulated translucent fiberglass window panels.
2. Reconfigure and refurbish two (2) existing aperture doors and closure doors for B-52s with different loadings. Replace aperture door motors & counterweight systems.
3. Replace all rollers, casters and top tracks.
4. Linear wire rope cable system including sheaves and sheave brackets.
5. Replace all chains.
6. Four (4) electrical control systems including enclosures, pre-wired control panel, variable frequency drives, pushbuttons stations at each end of each door, warning devices and limit switches & S.O. cable for power.
7. Four (4) motor operators that are internally mounted in the door framing of each lead door panel. The motor operators include a brakemotor, gear reducer and all required sprockets and roller chain and hinged cabinet door with limit switch for safety.
8. Double run of safety edge to run full height of the lead door panel(s).
9. Interior liner - 24ga prefinished sheeting - full height (see specification 07420 for Metal Liner Panels).

10. Remove & replace existing bottom hangar door rails; provide ASCE 60#/yd bottom rails, crossties, anchor bolts & bottom bumpers (see specification 05120 and 05500 for these items). See specification 03300 for concrete work.
11. Remove one (1) door panel to attain the new ten (10) door panel configuration.
12. All steel will be sandblasted and receive one coat of shop prime paint.
13. Configure doors to “chain” together when opening or closing (groups of 3 or 4). Remove & replace all existing motors in lead doors of door groupings (both ends for floating door groupings, lead end for anchored door groupings). Remove motors from all other doors. See #s 4, 6, & 7 above.
14. Provide additional insulation for all doors (see specification 07210 for rigid insulation).
15. Mitigate any lead or asbestos abatement necessary on any hazardous materials discovered during door renovation process.
16. Provide complete engineering, submittals and operating and maintenance manuals.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01400 SUBMITTALS:

1. Shop Drawings
   a. Hangar doors Operation and Maintenance Manual;
   b. Submit the door manufacturer's complete schematic wiring diagram, field wiring diagram, and a complete physical location drawing showing the location of controls with the runs of conduit, size of conduit, number and size of wires in each conduit, location of junction boxes, and full details of control mountings. (G)
   c. Submit drawings showing details of construction, installation, and operation; size, shapes, and thickness of materials; joints and connections; reinforcing; hardware; mechanical devices; electrical devices; and design and detail data for work of other trades affected by hangar doors. Include coordinated translucent panel system and exit door details. Shop drawings to be stamped by Professional Engineer (P.E.) (G)

1.5 QUALITY ASSURANCE

1. Doors and operating mechanisms shall be repaired by a hangar door manufacturer who has been continuously engaged in the design, manufacture, and installation of aircraft hangar doors for over 10 years. In order to meet the qualifications for this project, the door manufacturer must support with written evidence (if requested) that they have designed and manufactured a minimum of 50 Motor Operated Hangar Door systems which have been in satisfactory operation for a minimum of ten years. They must show evidence of 10 years’ experience rebuilding hangar doors at military installations.
2. Industrial Door Contractors, Inc.– Columbia, Tennessee (Tel: 931-380-0463, Fax: 931-380-3658, Website www.HangarDoor.com) has been identified as an accepted hangar door manufacturer for this project. Other door manufacturers that meet all criteria of this specification are acceptable.
3. Door repair must be by hangar door manufacturer. The installation shall be performed by the hangar door manufacturer.

4. Delivery, Storage, and Handling

Deliver materials which are not shop installed on the doors in original rolls, packages, containers, boxes, or crates bearing the manufacturer's name, brand, and model number. Store materials and equipment in dry locations with adequate ventilation, free from dust and water, and so as to permit access for inspection and handling. Handle doors carefully to prevent damage. Remove damaged items that cannot be restored to like-new condition and provide new items.

PART 2 PRODUCTS

2.1 HANGAR DOORS

A. Structural Steel:

AISC 335 and ASTM A 36/A 36M.

B. Formed Steel:

AISI SG-973.

C. Sheet Steel:

ASTM A 569/A 569M hot-rolled steel sheet, commercial quality, or ASTM A 366/A 366M cold-rolled steel sheet, commercial quality.

D. Galvanized Steel:

ASTM A 653/A 653M, coating designation G 90 galvanized steel sheet, commercial quality.

E. Exterior Covering:

The finish exterior color shall match as close as possible the color of the existing building. Close as possible will be determined by the Contracting Officer (furnished by others).

F. Interior Covering:

Manufacturer’s minimum 24-gauge prefinished sheeting secured to frame.

G. Hardware:

Provide hangar door hardware to accommodate actual dead loads plus wind loads specified. Provide top guide rollers, bottom wheels, interleaf bumpers, tractor pulls, track cleaners, and top bumpers as required for a complete and operational installation.

H. Bottom rails shall be designed by the door manufacturer to resist all dead loads, live loads, wind load, seismic load and operating loads applied to them by the hangar doors but not less than 60 pound ASCE rail.

I. Wheel Assemblies:

Wheel assemblies shall match existing rail conditions. Bottom wheels shall be of steel plate or cast steel, having a minimum tread diameter as required for the actual wheel loading. Where the height-to-width ratio of the door leaf exceeds three, wheel assemblies shall be vertically adjustable. Construct wheel assemblies to permit removal of the wheel without removing the door leaf from its position on the rail.

1. Treads: Machine wheel treads concentric with bearing seats. The clear distance between flanges shall not exceed the width of the rail by more than 1/8 inch at the tread nor more than 1/4 inch at the edge of the flange. Machine internal bearing seats accurately for a press fit. Heat treat wheels 18 inches or greater in diameter to obtain a rim hardness of 320 Brinnel.
2. Wheel bearings: Provide tapered roller or spherical bearings, either internal or cartridge type, arranged so that both horizontal and vertical loads shall be transferred to the rail only through the bearing. Bearings shall be tightly sealed and equipped with high-pressure grease fittings.

J. Vertical Floating Head Top Guide Rollers:

Provide top-roller assemblies to:

1. Move up and down within the specified live load positive and negative deflection of the roof in the vicinity of the door opening;
2. Allow easy removal through the top of the guide system; and
3. Include both horizontal and vertical rollers built into a frame which is connected in such manner as to transmit the specified wind loads from the door to the hangar structure and to prevent disengagement of the door from the top guide.

K. Weather Stripping:

Provide adjustable and readily replaceable material. Provide on vertical edges, sills, and heads to afford a weather tight installation.

L. Neoprene:

Use flap-type, two-ply, cloth-inserted neoprene or extruded, double flap, single or dual opposed solid neoprene material on vertical edges and sills. The two-ply material shall have a minimum thickness of 1/8 inch and shall be retained continuously for its full length and secured with rust-resistant fasteners 12 inches o.c. Extruded weather stripping with heavy center section shall be attached at 12 inches o.c., but continuous bar may be omitted. Clearance between metal parts on vertical edges of leaves and between leaves and jambs which are to be weather-stripped shall be as indicated.

M. Hanging Head Flashing:

Hanging Head Flashing: Galvanized steel, not lighter than 1.2 mm thick 18 gage, reinforced as required. Coordinate with hangar door manufacturer. Show exact location and configuration on top guide shop drawings. Top guide and head flashing system shall be shop assembled to verify accuracy of fit and fastener location, and disassembled for shipping. Install head flashing after doors are in place.

N. Fasteners:

Either zinc-coated or cadmium-plated steel.

O. Sealant:

Single-component or multi-component elastomeric type conforming to ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT. Provide a sealant that has been tested on the types of substrate to which it will be applied.

P. Primer:

Red iron oxide, zinc oxide type, SSPC Paint 25.

Q. Motorized Operation of Hangar Door:

1. Electrical Interlock for Personnel Doors: Provide each personnel door with an electrical interlock switch to prevent motor operation of the leaf or group in which it is located when the personnel door is open. Provide an identified indicator light at each door leaf control station indicating when the personnel door is in the open position.
2. Provide VFD in NEMA ICS 1, Type 12 enclosures equipped with access door-controlled, fused safety disconnect switches. Starters shall be factory wired with overload and under voltage protection, mechanical and electrical interlocks, auxiliary contacts, relays and timing devices as required, control circuit transformers, and a numbered terminal strip. The control circuit transformer shall reduce the voltage in the control circuits to 115 volts or less, and shall conform to UL 506.
3. Electrical: Provide conduit, wire, flexible cables, boxes, devices, and accessories, and install trolley duct.
4. The leaves mounted on the outer rails shall have the push buttons mounted on the exterior face; the leaves on the inner rails shall have the buttons mounted on the interior face; and the leaves on the middle rails shall have the buttons mounted on both the exterior and interior faces. The button at each edge of a leaf shall allow the leaf to travel with that edge as the leading edge only. The controls shall not be reversible. Location of each control button shall be as indicated.

R. Aperture Sensing Switches

Provide sensing switches on the aperture profile cushions, sensitized for horizontal and vertical movement and compression of the cushions, to afford a snug fit around the aircraft fuselage without damage to the aircraft. If the switches stop the horizontal movement of the Hangar door before complete closure, the door/aperture must be backed away from the aircraft fuselage and repositioned before reclosing on the aircraft. There shall be a minimum of three (3) switches per each aperture half, one each at the top, bottom and middle of the aperture cushion.

S. Cable System for Group Doors

The minimum size for the cable which interconnects the leaves shall be 3/8 inch; the cables shall be improved plow steel with lubricated hemp centers or wire rope cores. Sheaves over which the cables operate shall have a diameter of at least 18 cable diameters and either sealed ball-or roller-type bearings or graphite bronze bearings of a sufficient capacity for the operating loads. Grease fittings shall be provided for the sheave bearings unless permanently lubricated bearings are used.

2.2 FABRICATION

A. Doors

1. Frames and Framing - Door leaves shall be of welded or bolted construction. Joints shall develop 100 percent of the strength of the framing members. Vertical members shall be continuous throughout the height of the door. When required, prepare splices to facilitate field assembly in accordance with standard practice. Frames and framing members shall be true to dimensions and square in all directions; no leaf shall be bowed, warped, or out of line in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet. Provide diagonal bracing so that the completed leaf assembly will be braced to withstand shipping, assembly, and operational loads. Exposed welds and welds which interfere with the installation of various parts such as cover sheets shall be ground smooth.
2. Exterior Covering and Interior Liner Sheets - Corrugated and flat sheets shall be fastened to the frame either by edge welding, plug welding, or threaded fasteners 12 inches o.c. Where flat sheets are attached as interior liner sheets, the clear unsupported area shall not exceed 25 square feet. Make edges of exterior sheets weathertight.
3. Locking Devices - Do not provide locking devices on motor-operated hangar doors.
4. Tractor Pulls - Provide tractor pulls so that leaves can be towed by a tractor or similar equipment in the event of power failure. The tractor pull shall be designed for drive force to tow door or 5000 pounds whichever is greater. Minimum thickness steel plate shall be 3/8 inch.
5. Track Cleaners - Provide a device to clear debris from the rail head and wheel flange grooves as the leaf is moved.

2.3 OPERATION

A. Hangar Door Types

1. Hangar doors shall be motor operated. Include all wiring, busways, and controls as part of Base Bid.

B. Operating Units

Each operating unit shall move door leaves at a speed of approximately 60 feet per minute at zero wind load conditions and to be operable up to and including a maximum wind load of 8 pounds per square foot. The operating units shall consist of either a separate motor and gear reducer or a gearhead motor, high-speed shaft brake, and necessary roller chains and sprockets. The systems shall be provided with overload protection for the drive units and a means for emergency tractor towing operation.

1. Motors shall be single speed, squirrel-cage type of sufficient size to operate the leaves under zero wind load conditions at not more than 75 percent of their rated capacity.
2. Gear reduction units shall allow a reversal of effort through the gears without damage to the units.
3. Operating mechanisms shall be covered on the interior of the leaf by a hinged 16 gage flat steel cover.

C. Braking Systems

Braking systems shall be designed to ensure stoppage of the leaves under normal, dry rail conditions within the safety edge overtravel limit. The braking systems shall be either a magnetic,

spring-set, solenoid-released brake or hydraulic type. Provide a hand release to release the brake when it becomes necessary to move the leaf with an outside force. The hand release shall be an automatic reset type so that the brake will be operable during subsequent electrical operation of the door.

D. Controls

Doors shall be controlled by constant pressure push buttons mounted on both the interior and exterior side of the Hangar doors. Removing pressure from the button shall stop the movement of the leave. The control equipment shall conform to NEMA ICS 1 and NEMA ICS 2. Interior push buttons shall be mushroom head type, mounted in heavy-duty, oil-tight enclosures conforming to NEMA ICS 6, Type 13, except that enclosure for reversing starter with disconnect switch shall be Type 1 or Type 12. Exterior push buttons shall be in watertight enclosures conforming to NEMA ICS 6, Type 4. 'Closed' buttons for all hangar doors must have covered switch to protect against accidental operation.

E. Limit Switches

Provide limit switches to prevent overtravel and bumping. Safety edges shall not be used as limit switches.

F. Plunger-Type Limit Switches

Limit switches shall be actuated by 3/4 inch diameter stainless steel rods of adjustable length, guided at both ends with nonmetallic bearings and with tape-type constant force springs to return the rods to their normal position after actuation. The actuating rods shall have sufficient overtravel so that the leaves cannot bump one another or any portion of the building or be damaged when being towed. Each rod shall be adjustable 6 inches plus or minus from its normal position.

G. Safety Edges

Provide pneumatic safety edges from one inch above the floor to the top of the door leaf. For leaves 12 inches thick (including siding) or less, provide a single run of safety edge the full width of door. For leaves over 12 inches thick (including siding,) provide a double run of safety edge spaced to provide the maximum degree of safety in stopping the leaves. For leaves over 12 inches thick (including siding) provide a double run of safety edges on the outer edge of each side of door leaf covering no less than 80% of leaf.

1. Design: Provide safety edges to provide a minimum of 3 1/2 inches of overtravel after actuation until solid resistance is met and door motion comes to a complete stop. If door requires more than 3 ½ inches to come to a complete stop, provide additional overtravel built into safety edge the distance required for door motion to come to a complete stop. Use electric safety edges.
2. Specs: Use sensing edges of reinforced polyvinyl chloride cover or other Government-approved material with chemical resistance to diesel and JP-4 fuel, hydraulic fluids, SAE-30 oil and salt water. Use cover that provides hermetic seal for weather and moisture resistant protection of internal foam and contact elements. Internal foam may be polyurethane and/or latex foam per military specification MIL-R-5001, medium density. Use two contact elements separated by perforated foam or other Government -approved materials and design to perform the switching function when the sensing edge encounters an obstruction along any portion of its active length.

3. Operation: Actuation of the safety edge on leading edge of a group of leaves shall stop movement of the group. Actuation of a safety edge shall lock out the motor control in the direction of travel until reset, but shall permit the door to be reversed away from the obstruction which tripped the safety edge. Safety edges shall be alive only when doors are moving. Safety edges shall be reset by moving doors away from the obstruction. The lower portion of the safety edges to a height of approximately 5 feet shall be independently removable for convenience in servicing or repair. The remainder of the edge may be in one piece up to a maximum of 20 feet.
4. Keyed bypass: Provide a keyed bypass to the door controls to render the safety edges in temporary "repair" mode, if necessary. The door drive shall be restored from its "fail safe" mode by activation of the keyed bypass.

H. Warning Device

Provide a clearly audible signal on each individually operated leaf. The warning device shall

1. Operate when the push button is actuated for movement of the door in either direction;
2. Sound 5 seconds before the door moves, and while the door is moving; and
3. The horn shall be distinctly different from the fire alarm, and be loud enough to be heard in the hangar and on the apron.

I. Emergency Operation

Hangar doors shall be constructed and equipped so that they can be operated-manually or by tractors from the hangar floor in case of power failure. Manual operation of hangar doors shall be designed to avoid damage to safety edges.

J. Electrical Work

The door manufacturer shall provide the proper electrical equipment and controls built in accordance with the latest NEMA standards. Equipment, control circuits, and safety edge circuits shall conform to NFPA 70. Where located 18 inches or less above the floor, they shall be explosion-proof as defined in NFPA 70, Article 513. Manual or automatic control devices necessary for motor operation of the doors shall be provided, including push button stations, limit switches, combination fused disconnect switches and magnetic reversing starters, control circuit transformers, relays, timing devices, warning devices, and trolley ducts with collectors or trolleys.

K. Trolley Ducts

Provide one or more runs of trolley duct as required for the door system provided. Ducts shall have solid copper conductors in a protective polyvinyl housing. Locate ducts as shown on door manufacturer's drawings. Provide adequate clearances in the top guide system for the ducts.

1. Each run shall consist of the required number of sections of straight track, feed boxes, end caps, couplings, hangers, and other accessories to make the system complete and workable.
2. Furnish one track-supported tandem trolley or self-supporting collector for each motor-operated door, complete with spring-loaded brush contacts. Provide trolley pulling brackets and corrosion-protected chains attached from each side of the pulling bracket to each side of the tandem trolley or support bracket for self-supporting collectors.

PART 3 - EXECUTION

3.1 PROTECTIVE COATINGS

A. Cleaning

After fabrication, clean metal surfaces in accordance with panel manufacturer’s recommendations.

B. Painting

After cleaning, coat steel surfaces other than machine-finished parts with priming paint. Keep paint off of finished bearing surfaces. Before assembly, prime surfaces that will be inaccessible after assembly. Handle painted materials with care to avoid scraping or breaking the protective film. Make match-marks on painted surfaces only.

3.2 ERECTION

Assemble doors and accessories in accordance with approved shop drawings. Do not erect doors until the work of other trades in preparing the opening has been completed, the hangar roof is under full dead load, and the top guide and rail systems are within specified tolerances. Prior to erection “top coat” any surface which will become semi-concealed. After completing erection and before starting field painting, clean interior and exterior door surfaces. Clean abraded surfaces, field welds, and field bolts; and coat with priming paint.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Services

Provide an authorized installation crew of the door manufacturer for erection of doors.

B. Tests

Immediately after the door installation is complete, the door manufacturer or his representative shall perform a complete operating test in the presence of the Contracting Officer. Correct defects disclosed by the test. Retest the doors and adjust them until the entire installation is fully operational and acceptable to the Contracting Officer.

END OF SECTION 08340

SECTION 08450 - INSULATED TRANSLUCENT FIBERGLASS SANDWICH PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the insulated translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:

1. 2-3/4” thick flat factory prefabricated structural insulated translucent sandwich panels
2. Aluminum installation system
3. Aluminum sill flashing

B. Related Sections:

1. Structural Steel Framing: 05120
2. Cast in Place Concrete: 03300
3. Flashing and Sheet Metal: 07920
4. Metal Fabrications: 05500
5. Building Insulation: 07210
6. Steel Sliding Hangar Doors: 08340
7. Painting: 09900

1.2 SUBMITTALS

A. Submit manufacturer’s product data. Include construction details, material descriptions, profiles and finishes of components.

B. Submit shop drawings. Include elevations and details.

C. Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum.

1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
   a. Sandwich panels: 14” x 28” units
   b. Factory finished aluminum: 5” long sections

D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.

E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.

1. Reports required are:
   a. International Building Code Evaluation Report

b. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
c. Burn Extent (ASTM D 635)
d. Color Difference (ASTM D 2244)
e. Impact Strength (UL 972)
f. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
g. Bond Shear Strength (ASTM D 1002)
h. Beam Bending Strength (ASTM E 72)
i. Insulation U-Factor (NFRC 100)
j. NFRC System U-Factor Certification (NFRC 700)
k. Solar Heat Gain Coefficient (NFRC or Calculations)
l. Condensation Resistance Factor (AAMA 1503)
m. Air Leakage (ASTM E 283)
n. Structural Performance (ASTM E 330)
o. Water Penetration (ASTM E 331)
p. 1200°F Fire Resistance (SWRI)
q. LEED Credits
r. Daylight Autonomy

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.
2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 “Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems” as issued by the ICC-ES.

B. Installer’s Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

1.4 PERFORMANCE REQUIREMENTS

A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.

3. Structural Loads; Provide system capable of handling the following loads:
   a. Positive Wind Load: 50 PSF
   b. Negative Wind Load: 50 PSF

1.5 DELIVERY STORAGE AND HANDLING

A. Deliver panel system, components and materials in manufacturer's standard protective packaging.

B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.6 WARRANTY

A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within one year of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects in accessories, insulated translucent sandwich panels and other components of the work.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Manufacturers are required to meet the performance requirements specified within. Below is a listing of representative manufacturers for this product. Listing of these manufacturer's names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein, nor does this indicate an exhaustive list of acceptable manufacturers.

1. Kalwall Corporation, Tel: (800) 258-9777 – Fax: (603) 627-7905 – Email: info@kalwall.com
2. Muhler, Tel: (843) 572-9727
3. CPI Daylighting, Inc, Tel: (800) 759-6985 – Fax: (847) 816-0425 – Email: info@cpidaylighting.com

2.2 PANEL COMPONENTS

A. Face Sheets

1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
   a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
   b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.

2. Interior face sheets:

a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 50 and smoke developed no greater than 250 when tested in accordance with UL 723.
b. Burn extent by ASTM D 635 shall be no greater than 1."

3. Exterior face sheets:
   a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
   b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.

4. Appearance:
   a. Exterior face sheets: Smooth .070 thick and white in color.
   b. Interior face sheets: Smooth .045 thick and white in color.
   c. Face sheets shall not vary more than ± 10% in thickness and be uniform in color.

B. Grid Core

1. Thermally Broken Composite I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16."
2. I-beam Thermal break: Minimum 1", thermoset fiberglass composite.

C. Laminate Adhesive

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives."
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
   a. 50% Relative Humidity at 68° F: 540 PSI
   b. 182° F: 100 PSI
   c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
   d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.3 PANEL CONSTRUCTION

A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.

1. Thickness: 2-3/4"
2. Light transmission: 20%
3. Solar heat gain coefficient .28.

4. Panel U-factor by NFRC certified laboratory: 2-3/4" thermally broken grid .23
5. Complete insulated panel system shall have NFRC certified U-factor of .23.
6. Grid pattern: Nominal size 12 x 24; pattern shoji.

B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10' 0" span without a supporting frame by ASTM E 72.

C. Standard panels shall withstand 1200° F fire for minimum one hour without collapse or exterior flaming.

D. Thermally broken panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

A. Closure system: 2 ¾ Clamptite extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.

B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.

C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.

D. Finish:

1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's standards.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Installer shall examine substrates, supporting structure and installation conditions.

B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

3.3 INSTALLATION

A. Install the panel system in accordance with the manufacturer's suggested installation recommendations and approved shop drawings.

1. Anchor component parts securely in place by permanent mechanical attachment system.
2. Accommodate thermal and mechanical movements.
3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.

B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

3.4 CLEANING

A. Clean the panel system interior and exterior, immediately after installation.

B. Refer to manufacturer's written recommendations.

END OF SECTION 08450

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Prepare surfaces that are to receive finishes.

1.2 RELATED WORK

A. Construction Drawings.

1.3 SUBMITTALS

A. Product Data: Submittals shall be in accordance with Section 01400. Include data sheets of each type of finish Contractor intends to provide and location of material. Only the top of the line of the acceptable manufacturer for the different types of finishes specified shall be considered.

B. As requested by the Contracting Officer Representative, prepare and submit 12 x 12 inch minimum samples for review and acceptance.

C. Identify each sample submitted as to finish, formula, color name and number.

E. Paint colors and types shall be selected from manufacturer's standard color samples by the Contracting Officer Representative prior to commencement of work.

1.4 DELIVERY AND STORAGE

A. Deliver paint materials under provisions of Section 01600 in sealed original labeled containers, bearing manufacturer's name, type of paint, brand name, color designation and instructions for mixing and/or reducing.

B. Provide adequate storage facilities. Store paint materials at minimum ambient temperature of 45 degrees F in well ventilated area.

C. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture contents of surfaces are below following maximums:

1. Plaster and Gypsum Wallboard: 2 percent.

2. Masonry. Concrete, and Concrete Block: 12 percent.
3. Interior Wood: 15 percent.
4. Exterior Wood: 19 percent.

B. Ensure surface temperatures or the surrounding air temperature is above 40 degrees F before applying finishes. Minimum application temperatures for latex paints for interior work is 45 degrees F and 50 degrees F for exterior work. Minimum application temperature for varnish and finishes is 65 degrees F.

C. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 45 degrees F for 24 hours before, during and 48 hours after application of finishes.

D. Provide minimum 15 foot candles of lighting on surfaces to be finished.

1.6 EXTRA STOCK

A. Leave on premises, where directed by Owner, not less than one gallon of each color and/or finish used.

B. Containers to be tightly sealed and clearly labeled for identification.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Benjamin Moore
B. Devoe
C. Glidden
D. Pittsburg Paints.
E. Sherwin Williams
F. Olympic Stains.

2.2 MATERIALS

A. Paint, Varnish, Stain, Lacquer and Fillers: Type and brand listed or equivalent products subject to acceptance by Contracting Officer’s Representative.

B. Paint Accessories: Linseed oil, shellac, turpentine and other materials not specifically indicated herein but required to achieve the finishes specified. High quality and acceptable to paint manufacturer.

C. Paint: Ready-mixed products. Pigments fully ground maintaining a soft paste consistency, capable of readily and uniformly dispersed to a complete homogeneous mixture.

D. Paints to have good flowing and brushing properties and be capable of dry or curing free of streaks or sags.

2.3 BASE COLORS

A. Contractors to comply with Barksdale Air Force Base (BAFB) Color scheme. BAFB Color Scheme: Buff color is FS33690; Brown color is FS20117.

PART 3 - EXECUTION

3.1 INSPECTION

A. Thoroughly examine surfaces scheduled to be painted prior to commencement of work. Report in writing to Contracting Officer Representative, any condition that may potentially affect proper application. Do not commence until such defects have been corrected.

B. Correct defects and deficiencies in surfaces which may adversely affect work of this Section.

3.2 PROTECTION

A. Adequately protect other surfaces from paint and damage. Repair damage as a result of inadequate or unsuitable protection.

B. Furnish sufficient drop cloths, shields, and protective equipment to prevent spray or droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation area.

C. Place cotton waste, cloths, and material which may constitute a fire hazard in closed metal containers and remove daily from site.

D. Remove electrical plates, surface hardware, fittings and fastenings, prior to painting operations. These items are to be carefully stored, cleaned, and replaced on completion of work in each area Do not use solvent to clean hardware that may remove permanent lacquer finish.

3.3 PREPARATION

A. Remove surface contamination and oils from galvanized surfaces and wash with solvent. Apply coat of etching type primer.

B. Remove surface contamination and oils from zinc coated surfaces and prepare for priming in accordance with metal manufacturer’s recommendations.

C. Remove dirt, loose mortar, scale, powder, and other foreign matter from concrete and concrete masonry surfaces that are to be painted or to receive a clear seal. Remove oil and grease with a solution of tri-sodium phosphate, rinse well and allow to thoroughly dry.

D. Remove stains from concrete and concrete block surfaces caused by weathering of corroding metals with t solution of sodium Metasilicate after being thoroughly wetted with water. Allow to thoroughly dry.

E. Remove grease, rust, scale, dirt, and dust from steel and iron surfaces. Where heavy coatings

of scale are evident, removed by wire brushing, sandblasting, or any other necessary method. Ensure steel surfaces are satisfactory before paint finishing.

F. Clean unprimed steel surfaces by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts and nuts are similarly cleaned. Prime surfaces to indicate defects, if any. Paint after defects have been remedied.

G. Sand and scrape shop primed steel surfaces to remove loose primer and rust. Feather Out edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

H. Wipe off dust and grit from miscellaneous wood items and Architectural woodwork prior to priming. Spot coat knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried and sand between coats. Back prime interior woodwork.

I. Remove dust, grit, and foreign matter from exterior and interior wood or plywood siding which is to receive paint or stain finish. Seal knots, pitch streaks, and sappy sections with sealer. On wood surfaces to be painted, fill nail holes with exterior caulking compound after prime coat has been applied.

3.4 APPLICATIONS

A. Apply each coat at proper consistency.

B. Each coat of paint is to be slightly darker than preceding coat.

C. Sand lightly between coats to achieve required finish.

D. Do not apply finishes on surfaces that are not sufficiently dry.

E. Allow each coat of finish to dry before following coat is applied, unless directed otherwise by manufacturer.

F. Where clear finishes are required. Ensure tint fillers match wood. Work fillers well into the grain before set. Wipe excess from the surface.

G. Backprime interior woodwork, which is to receive paint or enamel finish with enamel undercoater paint.

H. Backprime interior, which is to receive stain and/or varnish finish, with doss varnish reduced 25 percent with mineral spirits.

I. Prime top and bottom edges of wood and metal doors with enamel undercoat when they are to be painted.

J. Prime top and bottom edges of wood doors with gloss varnish tinted with stain when they are to receive a stain or clear finish.

3.5 MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint exposed conduit and electrical equipment occurring in finished areas. Color and texture to match adjacent surfaces.

B. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing backboards and mounting equipment on them.

3.6 CLEANING

A. As work proceeds and upon completion, promptly remove paint where spilled, splashed, or spattered.

B. During progress of work keep premises free from any unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Upon completion of work leave premises neat and clean, to the satisfaction of Contracting Officer Representative and Owner.

3.7 EXTERIOR PAINTING AND FINISHING SCHEDULE

A. Treated posts, rough sawn plywood siding walls and ceilings, solid wood fascia, rough sawn wood eaves, wood soffits, solid wood trim (Natural Linseed Oil Water Repellent Stain):

1. Prime: None.
2. Finish: 2-Coats of stain. Use solid color stain on treated posts and semi-transparent color stain on rough sawn solid pine plywood siding, wood fascia, wood eaves, wood soffits and trim.

B. Steel (Alkyd, Gloss):

1. Prime: Touch up shop prime coat or I-Coat of Modified Epoxy Primer.
2. Finish: 2-Coats Urethane AJkyd Enamel.

C. Galvanized Steel (Acrylic Latex, Flat):

1. Prime: Acid etch or clean thoroughly with grease cutting solvent such as mineral spirits.
2. Finish: 2-Coats Exterior Latex Flat House Paint.

D. Steel Doors and Frames (Alkyd, Semi-Gloss Enamel):

1. Touch up shop prime coat or I-Coat Modified Epoxy Eggshell Rust Penetrating Metal Primer.
2. Finish: 2-Coats Alkyd Semi-Gloss House & Trim Paint.

E. Parking Stripping (Fast Dry Alkyd, Flat):

1. Prime: None.
2. Finish: 2-Coats Alkyd Flat Traffic Marking Paint for use on non-staining asphalt or

concrete.

F. Concrete Floor Sealer (Acrylic Latex Clear Semi-Transparent Sealer):
1. Prime: None.
2. Finish: 2-Coats Waterborne Acrylic Penetrating Clear Sealer.

3.8 INTERIOR PAINTING AND FINISHING SCHEDULE

A. Steel (Alkyd. Gloss):

1. Prime: Touch up shop prime coat or 1-Coat of Modified Epoxy Primer.
2. Finish: 2-Coats Urethane Alkyd Enamel.

B. Smooth Solid Wood Baseboard, door frames, window frames (Alkvd. Semi-Gloss Enamel):

1. Prime: 1-Coat Flat All-Purpose Latex Primer-Sealer.
2. Finish: 2-Coats Alkyd Semi-Gloss Enamel.

C. Gypsum Board -Wall Walls (Latex, Satin):
1. Prime: 1-Coat Flat Vinyl Latex Primer-Sealer.
2. Finish: 2-Coats Latex Satin Enamel.

E. Dry-Wall Ceilings (Latex, Flat Eggshell)

1. Prime: 1-Coat Flat Vinyl Latex Primer-Sealer.
2. Finish: 2-Coats Flat Ceiling Latex Paint or 1-coat fine texture spray-applied.

F. Rough Sawn Plywood Walls and Ceilings, Solid Rough Sawn Wood Trim (100% Acrylic Latex or Natural Linseed Oil Water Repellent Semi-Transparent Stain):

1. Prime: None.
2. Finish: 2-Coats of Semi-Transparent Stain.

G. Plywood and Solid Wood Supports for Countertops Not Exposed to View and Solid Wood or Plywood Shelving (Acrylic Latex, Semi-Gloss):

1. Prime: I-Coat Interior All-Purpose Latex Primer-Sealer.
2. Finish: 2-Coats Interior Latex Semi-Gloss Enamel.

H. Plywood Shelving (Alkyd Satin Varnish, Transparent Finish, Hand Rubbed Finish Appearance.

1. Prime: Washcoat of Stain Thinned with mineral spirits to give even finish, and 2 Coats Alkyd Satin Varnish.
2. Filler as required for open grain wood.
3. First coat: Vinyl Sealer. Lightly sand with 220 grit paper.
4. Finish: 2-top coats of Satin Varnish. Lightly sand between coats.

J. Concrete Block Wall-Moist Areas (Epoxy-Solvent Based Semi-Gloss Enamel):

1. Prime: 1-Coat Interior-Exterior Acrylic Latex Block Filler.
2. Finish Prime: 1-Coat Interior-Exterior Waterproofing Synthetic Resin Flat Masonry Coating.
3. Finish: 2-Coats Semi-Gloss Epoxy Coating, Tile-Like Finish.

K. Concrete Block Walls-Dry Areas (Acrylic-Latex, Semi-Gloss):

1. Prime: 1-Coat Interior-Exterior Acrylic Latex Block Filler.
2. Finish Prime: 1-Coat Interior All-Purpose Latex Primer-Sealer.
3. Finish: 2-Coats, Interior Acrylic Latex Semi-Gloss Enamel.

L. Concrete Floor Sealer (Acrylic Latex Clear Semi-Transparent Sealer):

1. Prime: None.
2. Finish: 2-Coats Waterborne Acrylic Penetrating Clear Sealer.

END OF SECTION 09900

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

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.

B. Codes and Standards: Where indicated, the referenced edition shall govern. Where not indicated, the latest edition shall govern.

1.2 SUMMARY

A. This Section includes the following:

1. Supporting devices for electrical components.
2. Electrical identification.
3. Control wiring.
4. Electrical demolition.
5. Cutting and patching for electrical construction.
6. Touchup painting.

1.3 SUBMITTALS

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

1.4 DEFINITIONS

A. General Explanation: A substantial amount of the Contract Document Specification language constitutes specific definitions for terms found in other Contract Documents, including the Drawings which must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated thereon. Certain terms used repetitiously in the Contract Documents are defined generally in this Article.

B. General Requirements: The provisions or requirements of the Division 1 Sections. The General Requirements apply to the entire work of the Contract, and where so indicated, to other elements of work which are included in the project.

C. Indicated: The term "Indicated" is a cross reference to the Details, the Notes, or the Schedules on the Drawings, other Paragraphs or Schedules in the Specifications, and similar means of recording requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for the purpose of helping the reader locate the cross reference, and no limitation of location is intended except as specifically noted.

D. Directed, Requested, Etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by the Contracting Officer's Representative," "requested by the Contracting Officer's Representative," etc. However, no such implied meaning will be interpreted to extend the Contracting Officer's Representative's responsibility into the Contractor's area of construction supervision.

E. Refer: Used to indicate that the subject is defined or specified in further detail at another location in the Contract Documents, or elsewhere as indicated. Except as otherwise noted, "refer" does not imply that the Contractor must purchase or subcontract the subject work in any special manner.

F. Approve: Where used in conjunction with the Contracting Officer's Representative's response to submittals, requests, applications, inquiries, reports and claims by the Contractor, the meaning of the term "approved" will be held to the limitations of the Contracting Officer's Representative's responsibilities and duties as specified in the General and Supplementary Conditions. In no case will "approval" by the Contracting Officer's Representative be interpreted as a release of the Contractor from responsibilities to fulfill the requirements of the Contract Documents.

G. Project Site: The space available to the Contractor for the performance of the work, either exclusively or in conjunction with others performing other work as part of the project. The extent of the project site may or may not be identical with the description of the land upon which the project is to be built.

H. Furnish: Except as otherwise defined in greater detail, the term "furnish" is used to mean supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

I. Install: Except as otherwise defined in greater detail, the term "install" is used to describe operations of the project site including unloading, unpacking, assembly, erection, placing, anchoring, connecting utilities, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

J. Provide: Except as otherwise defined in greater detail, the term "provide" means furnish and install, complete and ready for the intended use, as applicable in each instance.

K. Installer: The entity (person or firm) engaged by the Contractor or its Subcontractor or Sub-subcontractor for the performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in the operations they are engaged to perform.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70 (2011).

1.6 HAZARDOUS MATERIALS

A. Asbestos: No asbestos-containing materials have been identified on items that are indicated to be disturbed. If asbestos-containing materials are encountered, comply with the following:

Upon encountering any previously unidentified materials which he suspects may contain asbestos, the Contractor shall immediately cease all work in the immediate vicinity of the suspected materials and notify the Contracting Officer's Representative

1.7 COORDINATION

A. The electrical Plans and Specifications are a portion of the entire project. Other portions of the project contain information and requirements that will affect the electrical work. It is the responsibility of the Electrical Contractor to review all of the Contract Documents and to include those requirements in the bid.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the work.

C. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16 inch (14 mm) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Expansion Anchors: Carbon-steel wedge or sleeve type.

G. Toggle Bolts: All-steel springhead type.

H. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 ELECTRICAL IDENTIFICATION

A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each cable size.

1. Type: Preprinted, flexible, self-adhesive, vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.

C. Colored Adhesive Marking Tape for Wires, and Cables: Self-adhesive vinyl tape, not less than 3/4 inch wide by 3 mils thick (18 mm wide by 0.08 mm thick).

D. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

E. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16 inch (1.6 mm) minimum thickness for signs up to 20 sq. inch (129 sq. cm) and 1/8 inch (3.2 mm) minimum thickness for larger sizes. Engraved legend in black letters on white background.

F. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.

G. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.3 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Selection of Supports: Comply with manufacturer's written instructions.

D. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200 lb (90 kg) design load.

3.2 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps. Clamps less than 7 feet above the floor shall be one-piece without protruding edges or bolts.

F. Install 1/4 inch (6 mm) diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.

H. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. Existing Concrete: Expansion bolts.
4. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
5. Steel: Welded threaded studs or spring-tension clamps on steel.

    a. Field Welding: No field welding of supports to structural members will be allowed.

6. Light Steel: Sheet-metal screws. Do not penetrate outer skin of building from within.
7. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.3 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout project.

C. Self-Adhesive Identification Products: Clean surfaces before applying.

D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

E. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

1. Phase A: Black.
2. Phase B: Red.
3. Phase C: Blue.

F. Color-code 480/277-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

1. Phase A: Brown.
2. Phase B: Orange.
3. Phase C: Yellow.

G. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

H. Install engraved-laminated signs with black letters on white background with minimum 3/8 inch (9 mm) high lettering for equipment designations for switchgear or description of load being fed or controlled in the case of disconnects or contactors.

3.4 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials shall be fire resistant per ASTM E119 fire test conditions and shall be non-combustible when tested per ASTM E136. Melting point shall exceed 2000 degrees F per ASTM C24. Fireproofing installation for openings in rated floors or partitions shall provide an airtight seal.

3.5 EQUIPMENT AND CONTROL WIRING

A. Wire in and connect every motor and item of equipment furnished as a part of this Contract, including those furnished under other Divisions. Provide all required disconnecting means, boxes, conduit, conductors, etc. Motors and equipment furnished under other Divisions will be installed under that Division.

B. Motor starters and variable speed drives will be furnished under the division that the motors being controlled are furnished, and will be installed under Division 16 by the Electrical Contractor unless controllers are integral to the equipment. Installation includes mounting, connection to power and grounding.

C. Control Wiring: Furnish Control wiring as indicated on the drawings.

3.6 DEMOLITION

A. Protect existing electrical equipment and installations not indicated to be removed. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, appearance, and functionality.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Existing Work to Remain: Maintain feed, or provide new feed to equipment and devices that are not being removed.

E. Remove demolished material from project site.

F. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.7 SEQUENCING AND SCHEDULING

A. Electrical power and system interruptions shall be held to a minimum and will be permitted only at times approved by the Contracting Officer's Representative. The Contracting Officer's Representative may require that any interruptions be during nights, weekends, holidays, etc. Provide any required overtime work at no additional cost to Government.

B. Do not interrupt feed to any service, feeder or branch circuit feeding occupied facilities unless permitted under the following conditions and then only after arranging to make temporary provisions where required according to requirements indicated:

1. Notify Contracting Officer's Representative no fewer than seven (7) days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Contracting Officer's Representative written permission.
3. Provide all temporary facilities and services, including fire watch, required to maintain operation, security, and life safety.

3.8 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.9 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for electrical components.
2. Electrical identification.
3. Electrical demolition.
4. Cutting and patching for electrical construction.
5. Touchup painting.

3.10 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint:

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.11 CLEANING AND PROTECTION

A. Upon completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 16050

SECTION 16060 - GROUNDING AND BONDING

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 methods and materials for grounding systems and equipment, plus

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Comply with NFPA 70 (2011)

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

2.2 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Twist-On Connectors: Plastic body with coiled copper alloy wire forming threads.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 14 AWG and smaller, and stranded conductors for No. 12 AWG and larger, unless otherwise indicated.

B. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Single-phase motor and appliance branch circuits.
3. Three-phase motor and appliance branch circuits.
4. Flexible raceway runs.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.

END OF SECTION 16060

SECTION 16130 - RACEWAYS AND 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. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following: Division 16 Section 16050, "Basic Electrical Materials and Methods," for supports, anchors, and identification products.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

F. Fixture Whip: Flexible wiring as specified from box to individual lighting fixture.

1.4 SUBMITTALS

A. Product Data: For boxes, raceways, and fittings.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70 (2011).

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, and suspension system with other construction, including HVAC equipment and fire-suppression system.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Manufacturers:

1. Anamet Electrical, Inc.; Anaconda Metal Hose.
2. Electri-Flex Co.
3. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
4. LTV Steel Tubular Products Company.
5. Manhattan/CDT/Cole-Flex.
6. O-Z Gedney: Unit of General Signal.
7. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1. U. L. 6. Threaded with threaded fittings.

C. IMC: ANSI C80.6. U.L. 1242.

D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

E. Plastic-Coated IMC and Fittings: NEMA RN 1.

F. EMT and Fittings: ANSI C80.3.U.L.797, compression type.

G. FMC: Zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket.

I. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.2 BOXES

A. Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electrical Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Feter Co.; Adalet-PLM Division.
10. Spring City Electrical Manufacturing Co.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.3 FACTORY FINISHES

A. Finish: For raceway or boxes, provide manufacturer's standard finish applied to raceways and boxes before shipping.

PART 3 - EXECUTION

A. Use the following raceways for indoor installations:

1. Exposed in Unfinished Areas: EMT. Use IMC or Rigid Steel Conduit for locations subject to mechanical damage.
2. Concealed: EMT.
3. Connection to Vibrating Equipment: FMC; except in wet or damp locations, use LFMC.
4. Damp or Wet Locations: IMC.
5. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.

B. Minimum Raceway Size: 3/4 inch trade size (DN 21) unless noted.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduit.

3.2 INSTALLATION

A. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.

B. Do not support electrical equipment or raceways from ceiling grid or ceiling grid supports. Independently support all equipment and raceways directly from structural elements.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 16 Section 16050, "Basic Electrical Materials and Methods."

E. Install temporary closures to prevent foreign matter from entering raceways.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal raceways within finished walls, ceilings, and floors unless concealment is impossible or where otherwise indicated. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

I. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

J. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts; one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200 lb (90 kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

L. Flexible Connections: Use maximum of 12 inches (35 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings and finishes are without damage or deterioration at time of Substantial Completion. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 16130

SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Single- and double-pole snap switches and dimmer switches.
2. Device wall plates.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. PVC: Polyvinyl chloride.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70 (2011).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following (for each type of wiring device):

1. Single Pole Toggle Switch, 120-277V, 20A:
   a. Hubbell #HBL1221
   b. Leviton #1221-2
   c. P & S #20-AC-1

2.2 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished stainless steel. Material for Unfinished Spaces: Galvanized steel.
3. Material for Wet Locations: Thermoplastic, with spring-loaded lift cover, and listed and labeled for use in "wet locations". For receptacles, listing shall apply with plug cap inserted.

2.3 FINISHES

A. Color:

1. Wiring Devices Connected to Normal Power System: Ivory, unless otherwise indicated or required by NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies level, plumb, and square with building lines.

B. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 MOUNTING HEIGHTS

A. Mount toggle switches at 48” above finished floor to center of toggle handle.

3.3 IDENTIFICATION

A. Comply with Division 16 Section "Basic Electrical Materials and Methods”.

1. Switches: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

D. Do not connect stranded wire to devices using back wired push-in feature.

E. When terminating stranded conductors on devices, ends of strands shall be contained by insulation so that all strands must be held by screw.

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 16140

SECTION 16511 - INTERIOR LIGHTING

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 lighting fixtures mounted on exterior building surfaces.

1.3 DEFINITIONS

A. BF: Ballast factor. Ratio of light output of a given lamp(s) operated by the subject ballast to the light output of the same lamp(s) when operated on an ANSI reference circuit.

B. CRI: Color rendering index.

C. CU: Coefficient of utilization.

D. LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:

1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.

E. RCR: Room cavity ratio.

F. Fixture Whip: Flexible wiring as specified from box to individual lighting fixture.

1.4 SUBMITTALS

A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of fixture, including dimensions and verification of indicated parameters.
2. Emergency lighting unit battery and charger.
3. Fluorescent and high-intensity-discharge ballasts.
4. Lamps.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1, include the following:

1. Catalog data for each fixture. Include the diffuser, ballast, and lamps installed in that fixture.

D. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70 (2011).

E. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. As specified on the drawings or with approval prior to the bid. Approval granted prior to bid is subject, after the bid, to comparison with the specified equipment and to compliance with the plans, specifications and space limitation requirements.

2.2 FIXTURES AND COMPONENTS, GENERAL

A. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to

prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

F. Electromagnetic-Interference Filters: A component of fixture assembly. Suppress conducted electromagnetic-interference as required by MIL-STD-461D. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

2.3 LIGHTING FIXTURES

A. Fixtures: As scheduled on the Contract Drawings.

2.4 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

A. General: Comply with NEMA C82.4 and UL 1029. Shall include the following features, unless otherwise indicated.

1. Type: Constant-wattage autotransformer or regulating high-power-factor type.
2. Minimum Starting Temperature: Minus 22 degrees F (Minus 30 degrees C) for single-lamp ballasts.
3. Normal Ambient Operating Temperature: 104 degrees F (40 degrees C).
4. Open-circuit operation that will not reduce average life.

B. Auxiliary, Instant-On, Quartz System: Automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. Automatically turns quartz lamp off when high-intensity-discharge lamp reaches approximately 60 percent light output.

C. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.

D. High-Pressure-Sodium Ballasts: Solid-state igniter/starter with an average life in pulsing mode of 10,000 hours at an igniter/starter-case temperature of 90 degrees C.

1. Instant Restrike Device: Solid-state potted module, mounted inside high-pressure-sodium fixture and compatible with high-pressure-sodium lamps, ballasts, and sockets up to 150 W.

a. Restrike Range: 105- to 130-V ac.
b. Maximum Voltage: 250-V peak or 150-V ac RMS.

2.5 HIGH-INTENSITY-DISCHARGE LAMPS

A. High-Pressure-Sodium Lamps: NEMA C78.42, wattage and burning position as scheduled, CRI 21 (minimum), color temperature 1900, and average rated life of 24,000 hours.

2.6 FIXTURE SUPPORT COMPONENTS

A. Comply with ***Division 16 Section 16050, "Basic Electrical Materials and Methods,"*** for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, **12 gage (2.68 mm)**.

2.7 SOURCE QUALITY CONTROL

A. Provide services of a qualified, independent testing and inspecting agency to factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

B. Factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

3.2 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Verify normal operation of each fixture after installation.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

D. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

END OF SECTION 16511